User's Manual

R-STUDIO

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I   Introduction to R-Studio

R-Studio is a family of powerful and cost-effective undelete and data recovery software. Empowered by new unique data recovery technologies, it is the most comprehensive data recovery solution for recovering files from FAT12/16/32, exFAT, NTFS, NTFS5 (created or updated by Windows 2000/XP/2003/Vista/2008/7/8), ReFS (Resilient File System, a new local file system Microsoft has introduced in its Windows 2012 Server.), HFS/HFS+ (Macintosh), Little and Big Endian variants of UFS1/UFS2 (FreeBSD/OpenBSD/NetBSD/Solaris), Ext2/3/4FS (Linux), and exFAT partitions. It functions on local and network disks, even if such partitions are formatted, damaged or deleted. Flexible parameter settings give you absolute control over the data recovery.

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1.1   R-Studio Features

R-Studio is a family of file restoring utilities. It recovers files both on local disks and on disks on remote computers over network, even if their partition structures are damaged. A unique *IntelligentScan* technology and flexible parameter settings give you real control over the fastest data recovery ever seen.

R-Studio features:
- Standard "Windows Explorer" - style interface.
- Host OS: Windows 9x, ME, NT, 2000, XP, 2003, Vista, 2008, 7, Windows 2012 Server.
- Remotely recovers data over network. Data can be recovered on network computers running Windows, MacOS X, Linux, and some other UNIX OS.
- Supported file systems: FAT12, FAT16, FAT32, NTFS, NTFS5 (created and updated by Windows 2000/ XP/2003/Vista/7), exFAT, ReFS file system (Resilient File System), a new local file system Microsoft has introduced in its Windows 2012 Server, Ext2/3/4FS (created by Linux or other OS), HFS, HFS+, HFSX, and UFS1, UFS2, UFS BigEndian (used by the FreeBSD, OpenBSD, and NetBSD operating systems).
  Please note, that when a file is being deleted on the HFS, HFS+, HFSX file systems, the computer completely removes all system information on it, and there is no way to recover the deleted file except by using the **Extra Search for Known File Types** option. Nevertheless, **R-Studio** is able to read existing files from HFS, HFS+, and HFSX disks.
- Support for known file types. **R-Studio** searches for files with known typical features of their structures allowing the user to search for files on devices with unknown files systems, including an HD, CD, DVD,

floppy disk, Compact Flash Card, USB drive, ZIP drive, Memory Sticks, and other removable media.

- Scan process visualization. While scanning an object, **R-Studio** graphically shows items that have been found, including files of known types, FAT and NTFS MFT records, boot records, etc.
- Mass file recovery support.
- Support for file recovery lists - lists of files that can be exported from **R-Studio**, manually edited, and then loaded back. Files from such lists will be automatically marked for recovery.
- Dynamic disk support.
- Software RAID, volume set, and stripe set support. Support for RAID 6, RAID 5, and RAID 4 layouts. Support for custom RAID layouts. Parameters like block size and order, offsets, and even the number of stripe blocks can be explicitly specified. Custom RAID configurations can be saved.
- RAID consistency check (check for valid data parity values).
- Hardware RAID, volume set, and stripe set support.
- Automatic RAID parameter recognition.
- Creates image files for an entire hard drive, logical disk, or its part. Such image files can be processed like regular disks. Images can be either simple exact object copies (Plain images) compatible with the previous versions of **R-Studio**, or compressed images that can be compressed, split into several parts, and password-protected. Such images are fully compatible with the images created by **R-Drive Image**, but incompatible with the previous versions of **R-Studio**. Images may be saved either on the local or remote computer. **R-Studio** can scan objects while creating their images.
- Advanced object copy. In addition to byte to byte copy of any object visible in the Drives panel, smart copy of partitions and hard drives is available.
- Recovers files on damaged or deleted partitions.
- Recovers compressed files (NTFS, NTFS5).
- Recovers encrypted files (NTFS5).
- Recovers alternative data streams (NTFS, NTFS5).
- Recognizes localized names.
- Recovered files can be saved on any (including network) disks visible to the host operating system.
- A hexadecimal disk and file editor supporting NTFS file non-resident attribute editing.
- Patterns (or templates) in the hexadecimal editor allowing for parsing the data according to specific data structure. Such patterns may be custom-created.
- File preview. Most of the file types can be previewed to estimate recovery chances.
- Enhanced remote host scanning procedure. In the **R-Studio** network versions, data is analyzed on the remote host rather than on the home host, thereby the speed of recovery procedure greatly increases. The scan information may be saved either on the local or remote computer.
- Recovered files may be saved on a disk on a connected remote computer rather than be transferred over network to the local one. Saving recovered files on a remote computer may be useful when the remote computer has a healthy disk because you do not have to transfer files over network. It may be an external USB hard drive, for example.
- Forensic mode. (For the Technician version only).
- **R-Studio Emergency***. The **R-Studio Emergency** version starts from a floppy or compact disk when it is necessary to recover data on a computer, on which Windows cannot start up because its system files are corrupted or deleted.

*The **R-Studio Emergency** is a part of the **R-Studio** software package. When you buy an **R-Studio** single

license you may run the **R-Studio Emergency** or/and install the **R-Studio** Windows version on one PC only and you may not transfer the licensed software to another PC.

R-Studio recovers files:

- That have been removed without the **Recycle Bin**, or when the **Recycle Bin** has been emptied;
- Removed by virus attack or power failure;
- After the partition with the files was reformatted, even for a different file system;
- When the partition structure on a hard drive was changed or damaged. In this case, **R-Studio** can scan the drive trying to find previously existed partitions and recover files from found partitions.
- From disks with bad sectors. In this case, **R-Studio** can first copy the entire disk or its part into an image file and then process such image file.

R-Studio can create image files for an entire hard drive, logical disk, or its part. Such image files can be processed like regular disks. Images are very useful if there is a risk of total data loss due to hardware malfunction. If bad blocks are constantly appearing on a hard drive, the only way to save the data is to immediately create an image of that drive. All data search, scan and recovery can be done from this image.

To learn more about the *IntelligentScan* technology, go to the **IntelligentScan** topic .

1.2   System Requirements

- An Intel-compatible platform running Windows 9x/ME/NT4.0/2000/XP/2003/Vista/7/8/ 2012 Server.
- At least 32 MB of RAM, a mouse, and enough disk space for recovered files, image files, etc.
- The administrative privileges are required to install and run R-Studio utilities under Windows NT/2000/ XP/2003/Vista/7/8/2012 Server.
- A network connection for data recovering over network.

1.3   Contact Information and Technical Support

To obtain the latest version of **R-Studio**, go to:
   Product Site: http://www.r-tt.com
   Sales Department: sales@r-tt.com

R-Studio Technical Support Team is available 24 hours a day, seven days a week, and has an average response time less than 4 hours.
   Tech. Support: support@r-tt.com
   Send your support request to: http://www.r-tt.com/SupportRequest.shtml

File Recovery FAQ: http://www.r-tt.com/File_Recovery_FAQ.shtml
R-tt Forum: http://forum.r-tt.com

1.4 R-Studio Main Panel

When **R-Studio** starts, its main panel appears on the Windows desktop.

R-Studio Main panel
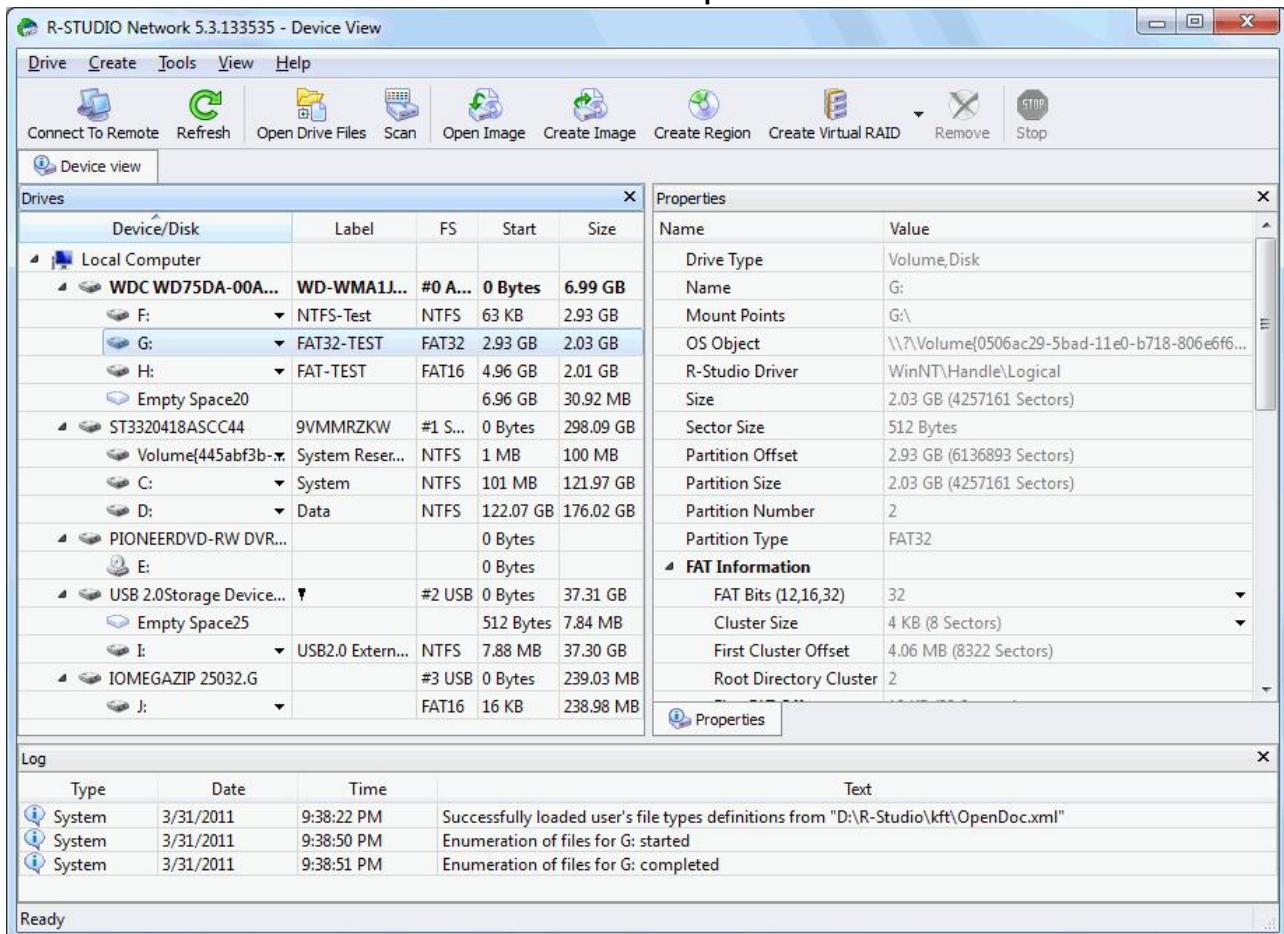
<p style="text-align:center">Drives panel:</p>
<p style="text-align:center">You can select an object by clicking on it.</p>

Device/Disk	Label	FS	Start	Size
▲ 🖳 Local Computer				
▲ 💿 **WDC WD75DA-00A...**	**WD-WMA1J...**	**#0 A...**	**0 Bytes**	**6.99 GB**
💿 F: ▾	NTFS-Test	NTFS	63 KB	2.93 GB
💿 G: ▾	FAT32-TEST	FAT32	2.93 GB	2.03 GB
💿 H: ▾	FAT-TEST	FAT16	4.96 GB	2.01 GB
💿 Empty Space20			6.96 GB	30.92 MB
▲ 💿 ST3320418ASCC44	9VMMRZKW	#1 S...	0 Bytes	298.09 GB
💿 Volume{445abf3b-...	System Reser...	NTFS	1 MB	100 MB
💿 C: ▾	System	NTFS	101 MB	121.97 GB
💿 D: ▾	Data	NTFS	122.07 GB	176.02 GB
▲ 💿 PIONEERDVD-RW DVR...			0 Bytes	
👤 E:			0 Bytes	
▲ 💿 USB 2.0Storage Device...	▾	#2 USB	0 Bytes	37.31 GB
💿 Empty Space25			512 Bytes	7.84 MB
💿 I: ▾	USB2.0 Extern...	NTFS	7.88 MB	37.30 GB
▲ 💿 IOMEGAZIP 25032.G		#3 USB	0 Bytes	239.03 MB
💿 J: ▾		FAT16	16 KB	238.98 MB

<p style="text-align:center">A logical disk may be represented by its name or its partition.</p>

⊟ 💿 **QUANTUMFIREBAL...**	
💿 F:	NTFS-Test
💿 G: ☑	FAT32-TEST
💿 G:	FAT-TEST
⊟ 💿 💿 Partition2	
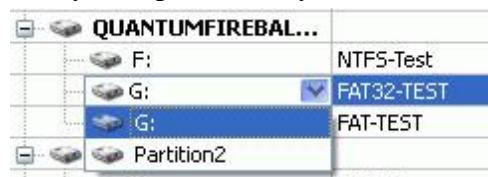
Properties tab:

This tab shows the properties of an object selected on the Drives panel.

Depending on the selected object, information on this Properties tab may vary.

The Properties tab names and values are described in detail on the Properties tab topic.

Log panel

Changing the program language

You may select the language of **R-Studio** main panel and its help. To do so, select an available language on **Change Language** on the **Help** menu.

Panel view options

You may set which panels and bars to enable/disable.

⊟ *To enable/disable:*

Toolbar	Select/clear **Toolbar** on the **View** menu
Status bar	Select/clear **Status bar** on the **View** menu
Drive pane	Select/clear **Device View** on the **View** menu
Properties pane	Select/clear **Properties View** on the **View** menu
Log panel	Select/clear **Event Log** on the **View** menu

If you have several tabs in the right pane, you may easily switch to any of the tab by selecting on the **View** menu	
Properties Tab	to view the Properties tab
Scan Information Tab	to view the Scan Information Tab tab
Parents Tab	to view the Parents tab
Properties	Select data types in which the data will be represented

Connect to Remote
Click this button to connect to a remote computer on a network.

Refresh
Click this button to refresh the panels.

Scan
Click this button to start scanning a selected object.

Open Drive Files
Click this button to start searching for files on a selected object.

Open Image
Click this button to open a previously created image.

Create Image
Click this button to create an image of a selected area.

Create Region
Click this button to create a region on a selected disk.

Create Virtual RAID
Click this button to create a virtual volume set or RAID.
Select an appropriate type from the menu.

Remove
Click this button to remove a selected object on the main panel.

Stop
Click this button to stop the current operation.

Sometimes, there may be a lot of similar objects on the Drives panel. Those may be components of a RAID, for example. You may turn numerical indexes for such objects to distinguish them better. Those indexes will appear before the object names on the Drives panel.

To turn the numerical indexes on/of, go to the **Device** item on the **View** menu, and select/clear:

Show Physical Drives Indexes   to display the indexes only for hard drives
Show All Objects Indexes   to display the indexes for all objects on the Drives panel

You may select the units in which object's start and size are displayed

To select the units

1   Select Devices on the View menu

2   Select the units in which you want to see object sizes.

You may select
Show as Bytes
Show as Sectors
Show as Bytes and Sectors

Depending on the task **R-Studio** performs, its panel may vary. Those panels are described in appropriate topics. The Properties tab names and values are described in detail on the **Properties tab** topic.

The general settings can be set on the Settings dialog box.

R-Studio has two operation modes:

File search on a partition (including recently found during disk scan).

In this mode, **R-Studio** analyzes MFTs on NTFS partitions, FATs on FAT partitions, and SuperBlocks on Ext2/3/4FS partitions. Then it displays all files which records have been found in the analyzed tables. Then recently deleted files, which records still remain, can be recovered. If files have not been found, that means that their records have been deleted. In this case, the disk must be scanned.

File search supports file masks and regular expressions. Multiple files in different folders can be found and recovered in one recover session.

R-Studio supports mass file recovery. There is no limit in the number of files that may be recovered during one session.

File content may be previewed before recovery.

File or disk binary data can be viewed and edited in the text/hexadecimal editor. Also can be viewed and changed all attributes for NTFS files.

Disk scan, searching for partitions.

In this mode, **R-Studio** scans the entire disk or its part. Using a number of statistic and deterministic criteria known as *IntelligentScan* technology, it determines existing or existed partitions on the disk, and their file systems. It is also possible to add new partitions, by setting manually all required parameters.

A disk can be scanned through several successive scans, each with its own parameters. **R-Studio** accumulates the information from successive scans and keeps track of changes in the information obtained from different

scans. The information obtained from the disc scan can be stored in a file. It may be loaded and processed later at any convenient time.

1.5 R-Studio Settings

You may specify some global setting for **R-Studio** on the Settings dialog box. You may reach it by selecting **Settings** on the **Tools** menu.

Main

    Main **dialog box**
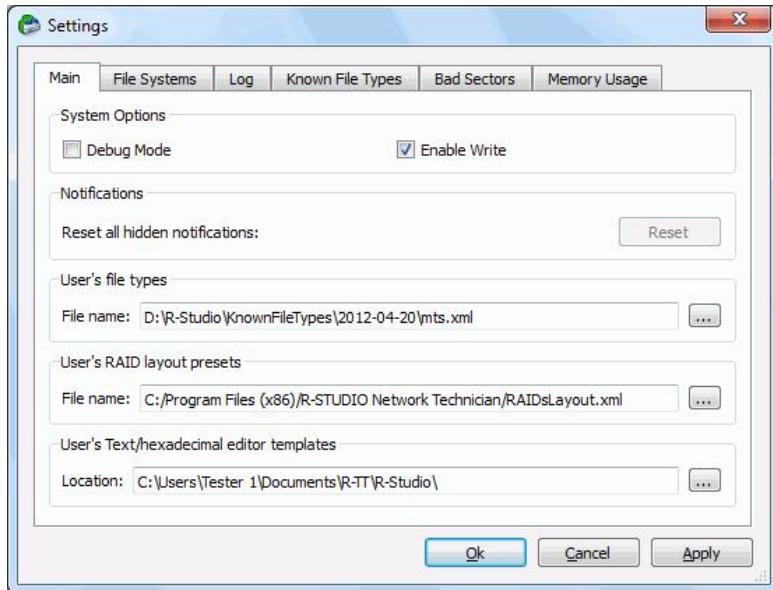
    ⊟ **Main settings**

System Options	
Enable Write	If this check box is selected, **R-Studio** enables you to write any changes made in the **Text/hexadecimal editor**.
Debug Mode	If this check box is selected, **R-Studio** displays an additional command **Create FS Snapshot** on the shortcut menu for an object with a file system. An FS Snapshot contains system data for the file system only (file descriptions without file contents). If a problem appears, this snapshot can be sent to **R-Studio** technical support to identify the problem. This option greatly slows **R-Studio**.
Notifications	
Reset all hidden notifications	This button enables all previously disabled notification and warning messages.
User's file types	
File name	Specifies a file name and path to the file where the descriptions of user's known file types are stored. You need to re-start **R-Studio** or click the Reload User's File Types button on the Known File Types tab for the new file to take effect.
User's RAID layout	
File name	Specifies a file name and path to the file where the descriptions of

	user's RAID layouts are stored
HexView templates path	
Location	Specifies the path for pattern description files for **Text/ Hexadecimal editor**.

File Systems

File Systems **dialog box**
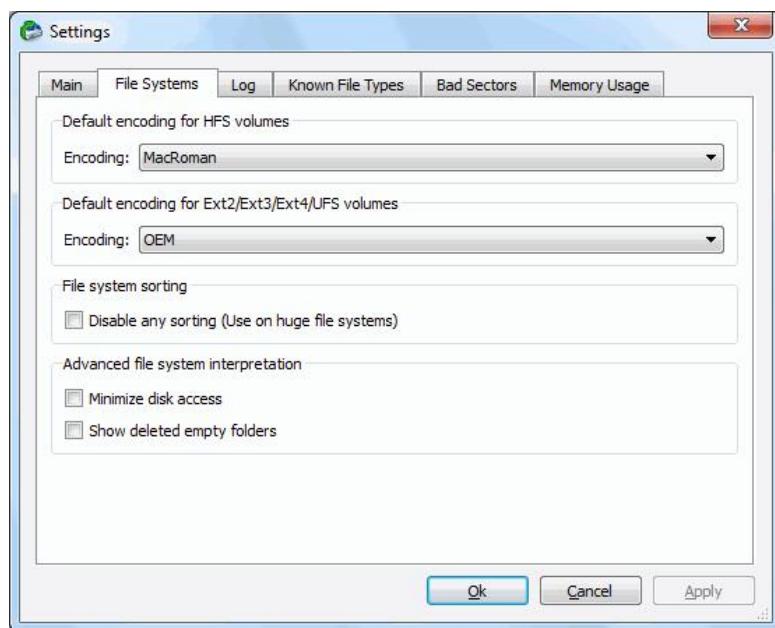
File Systems

Default encoding for HFS volumes	Select the national encoding for the HFS partitions.
Default encoding for Ext2/Ext3/Ext4/UFS volumes	Select the national encoding for the Ext2, Ext3, Ext4, and UFS partitions.
Disable any sorting	Select this option if the number of files on the disk is so large that **R-Studio** sorts files in selected folders for too long time.
Minimize disk access	Select this option if a lot of bad sectors are on the hard drive. **R-Studio** will reduce access to internal files in the file system to speed up the interpretation of file system data.
Show deleted empty folders	Select this option if you want to view empty deleted folders.

Log

Log **dialog box**
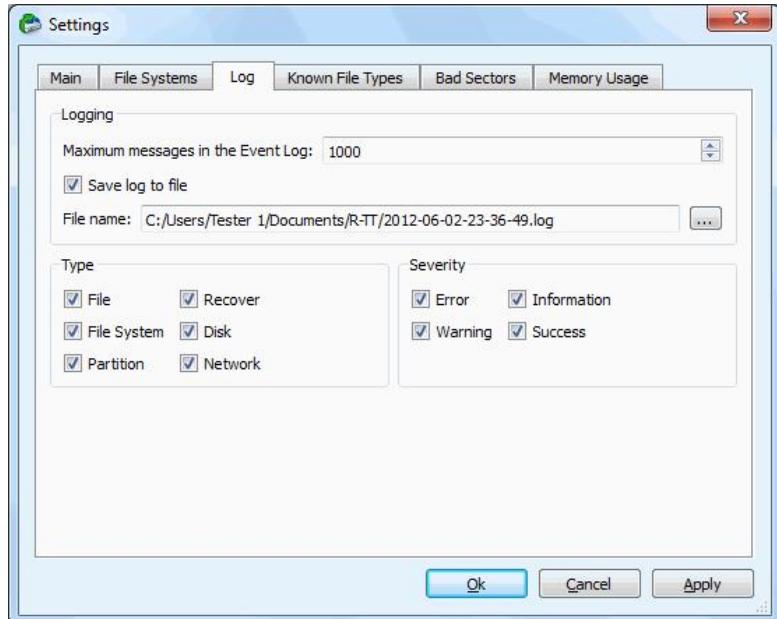
Log options

Logging	
Maximum messages in the Event Log	Specifies the maximum number of messages **R-Studio** will keep in the event log
Save log to file	If this check box is selected, **R-Studio** writes its log into a log file specified in the File name field.
File name	Specifies the file name in which the log will be saved.
Type	
File	If this check box is selected, **R-Studio** logs all events with recovered files.
File System	If this check box is selected, **R-Studio** logs all events with the file system.
Partition	If this check box selected, **R-Studio** logs all events with partitions.

Recover	If this check box is selected, **R-Studio** logs all events with the recovering processes.
Disk	If this check box is selected, **R-Studio** logs all events with disks.
Network	If this check box is selected, **R-Studio** logs all events with network operation.
Severity	
Error	If this check box is selected, **R-Studio** adds error messages into its log.
Warning	If this check box is selected, **R-Studio** adds warning messages into its log.
Information	If this check box is selected, **R-Studio** adds information messages into its log.
Success	If this check box is selected, **R-Studio** adds success messages into its log.
NEVER WRITE A LOG FILE ON THE DISK FROM WHICH YOU RECOVER DATA!!! **Or you may obtain unpredictable results and lose all your data.**	
Note: If in the Recover dialog box the Condense successful restoration events check box is selected, the Log will display only Error, Warning, and Information event messages.	

Known File Types

Known File Types **dialog box**
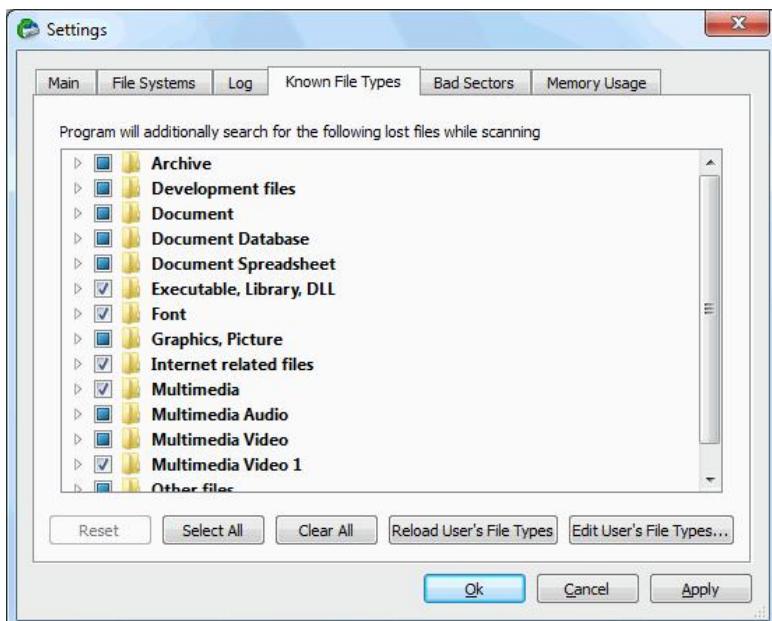
You may specify which **Known File Types** will be enabled/disabled by default. You may also specify know file types to search for during a specific scan session on the Scan dialog box.

- **Known File Types**

Reset	Click this button to reset the settings to the previous state. Active until the **Apply** button is clicked.
Select All	Click this button to select all file types in the list.
Clear All	Click this button to clear all file types in the list except some predefined ones.
Reload User's File Types	Click this button to apply new file types after the user's file types file has been changes from the Main tab.
Edit User's File Types	Click this button to add a new customer's Known File Type, or to edit already existing ones. See the Customizing File Types help page for more details.

Bad Sectors

Bad Sectors **dialog box**

⊟ **Bad Sectors settings**

Default read attempts	Specifies a default value for I/O Tries, or how many times **R-Studio** will try to read a bad sector. You may specify this parameter for each drive separately on the Properties tab.
Set for all drives	Click this button to reset I/O Tries for all drives to the default value.
Pattern to fill bad blocks	Specifies a default pattern **R-Studio** will use to fill bad sectors in files to recover, in images, or when showing data in the **Text/hexadecimal editor**. You may specify the pattern either in the ANSI or Hex data format. **Note: R-Studio** will never ever try to write anything on the disk from which data is to recover or an image is to create.

Memory Usage

Memory Usage **dialog box**
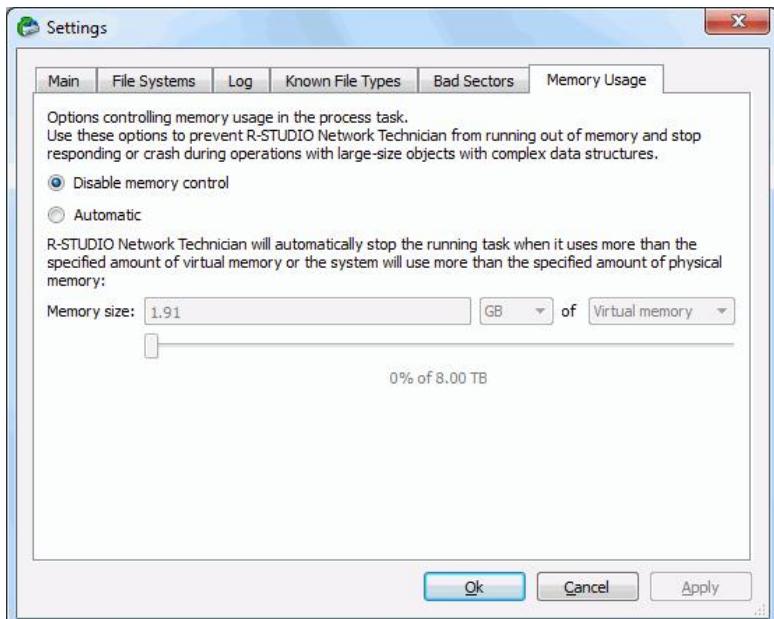
These settings control how much memory **R-Studio** uses for its work. They help preventing **R-Studio** from locking when trying to perform very memory-consuming tasks like scanning large disks or processing file systems with a lot of files.

⊟ **Memory Usage settings**

Disable memory control	If this option is selected, the memory control is disabled.
Automatic	If this option is selected, **R-Studio** will automatically stop performing the task when the amount of used memory reaches the specified value. You may specify the limit for either the virtual or physical memory.

You may see how much memory **R-Studio** actually uses on the Memory Usage dialog box.

II   Data Recovery Using R-Studio

Depending on the situation, data recovery may vary:

1. **Recovery of deleted files that have resided on an existing logical disk**
   This can be done using Basic File Recovery.

2. **Recovery of files that have resided on a data disk with a damaged file system, or on a previously deleted or re-formatted partition**
   If the file system on such logical disk is damaged, the operating system sees that logical disk as a partition without a valid file system. Such partition should be previously scanned. Also, it should be scanned if you want to recover data on a previously deleted or re-formatted partition.
   When the partition is scanned, a number of recognized partitions will appear. **R-Studio** shows them in different colors depending on which elements of the partition have been found.

F:	An existing logical disk or partition
Recognized2	Both boot records and file entries are found for this partition
Recognized1	Only file entries are found for this partition
Recognized3	Only boot records are found for this partition
Empty Space21	Empty space on the object
Extra Found Files	Files that have been found using scan for known file types.

   Although such recognized partitions are virtual objects, files can be searched for and recovered from recognized partitions as from real logical disks using Basic File Recovery.
   To successfully recover files from a recognized partition, it is necessary to find a right one which corresponds to the real logical disk on which the files resided. No strict rules can be applied to that, but the following considerations should be taken into account:

   - If you are going to recover files from a **disk with a damaged file system**, most likely the right recognized partition will be a green one.

   - If you are going to recover files from a **previously deleted or re-formatted partition**, most likely the right recognized partition will be a yellow one.

   Also always check the recognized partition's file system, start point, and size. They should be the same for the recognized partition and real logical disk/partition. When in doubt, try to preview a couple of files from the recognized partition. If the files are seen correctly, this is the right partition.

3. **Data recovery from a damaged system disk. The computer does not start up.**

   - If this computer is on a network, create an **R-Studio Agent Emergency** startup disk for the computer, install **R-Studio** on another computer on the network, and recover data over network.

   - If this computer is stand-alone, create an **R-Studio Emergency** startup disk and use it to start up the computer and recover data. You may use external USB hard disks to store recovered files.

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2.1   Basic File Recovery

NEVER TRY TO SAVE RECOVERED FILES/FOLDERS TO THE SAME LOGICAL DISK WHERE THEY RESIDE!!!
Or you may obtain unpredictable results and lose all of your data.

See the **Data Recovery Issues** topic for details.

Basic file recovery can be made for deleted files that has resided on an existing logical disk visible to the operating system. In all other cases, Advanced Data Recovery is required.

To recover deleted files from a logical disk (recognized partition),

1   **Double-click a logical disk on the R-Studio's** Drives **panel to enumerate files on the disk**

   ▣ *Other ways to enumerate files*

   • Select the disk and click the **Open Drive Files** button,

   or

   • Right-click the selected disk and select **Open Drive Files** on the shortcut menu,

   or

   • Select the disk and press the **F5** key.

   or

   • Select **Open Drive Files** on the **Drive** menu

   If you try to enumerate files on a hard drive or another object without a valid file system on it, a Double-click a logical disk... message will appear. Select a logical disk on the object or scan the object.

>   **R-Studio will change its panel showing the disk's folders/files structure**

   R-Studio analyzes data on the object and displays all files for which records have been found in the analyzed tables. If files have not been found, that means that their records have been deleted. To find such files, Advanced Data Recovery is required.

   Please note that **R-Studio** shows only those files/folders that match a specified file mask.

⊟ **R-Studio Main panel**
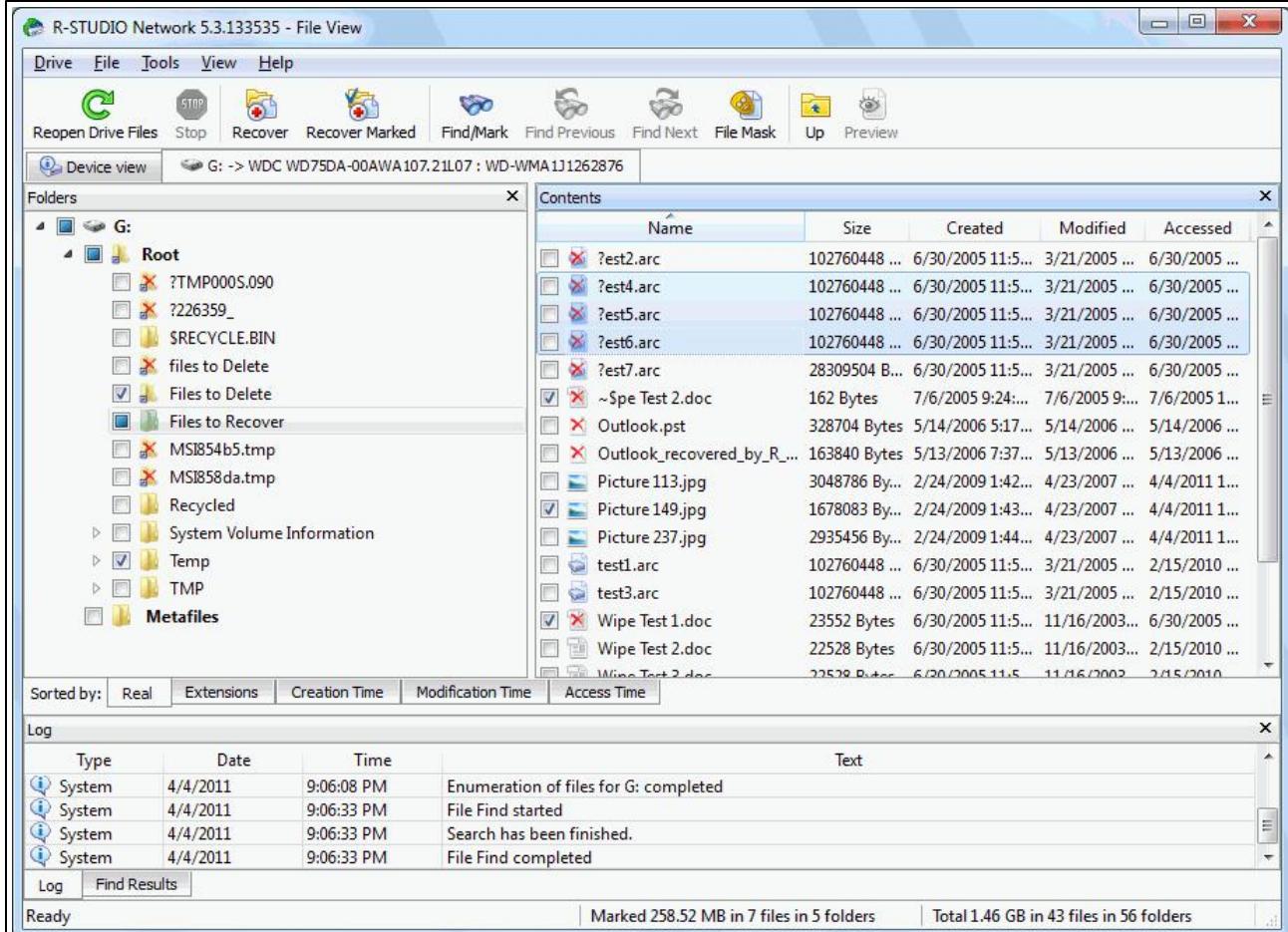
Panel view options

You may set which panels and bars to enable/disable. To enable/disable

The **Toolbar**	Select/clear **Toolbar** on the **View** menu
The **Status** bar	Select/clear **Status bar** on the **View** menu
The Folders panel	Select/clear **Folders View** on the **View** menu
The Files panel	Select/clear **Contents View** on the **View** menu
The Log panel	Select/clear **Event Log** on the **View** menu
The Find Results panel	Select/clear **Find Results** on the **View** menu

You may also arrange the data as required. On the **View** menu, select **Arrange** and them a required arrangement.

You may specify which columns will be visible on the Files panel. On the **View** menu, select **Contents Columns**, and select the columns you want to see.

Folders panel

☐ ✗ Recovered_Files	Deleted folder
⊟ ☑ 📁 Temp	Marked folder (all child objects in this folder are marked)
⊟ ◼ 📁 Files to Recover	Partially marked folder (some child objects in this folder are marked)
☐ 🗇 Files to Delete	Cross-linked folder (A FAT folder containing data which also belongs to other FAT folders.)
☑ ✗📁 ?MP	Questionable cross-linked deleted folder (A FAT folder found by **R-Studio**, but with apparently invalid content.)

Files panel:

☐ ❌ ?est5.arc   Deleted file:

☑ ❌ ?est7.arc   Marked deleted file

☐ ❌ ?est4.arc   Selected deleted file

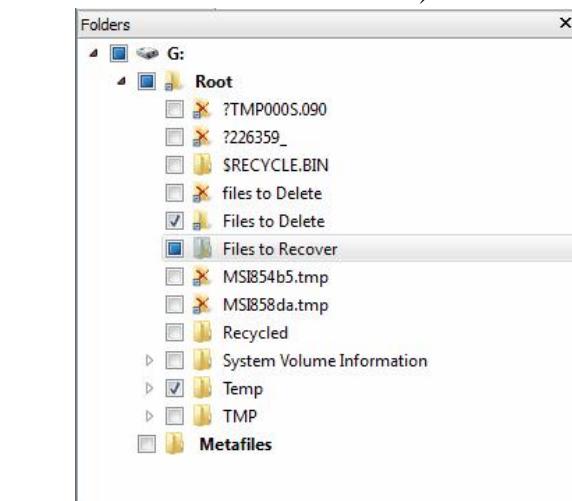| Name	Size	Created	Modified	Accessed	FileId	ParentId
❌ ?est2.arc	102760448 ...	6/30/2005 11:51:40 PM	3/21/2005 8:23:04 PM	6/30/2005 12:00:00 AM	67	63
❌ ?est4.arc	102760448 ...	6/30/2005 11:54:04 PM	3/21/2005 8:24:20 PM	6/30/2005 12:00:00 AM	69	63
❌ ?est5.arc	102760448 ...	6/30/2005 11:55:18 PM	3/21/2005 8:24:58 PM	6/30/2005 12:00:00 AM	70	63
❌ ?est6.arc	102760448 ...	6/30/2005 11:56:32 PM	3/21/2005 8:25:36 PM	6/30/2005 12:00:00 AM	71	63
❌ ?est7.arc	28309504 B...	6/30/2005 11:57:45 PM	3/21/2005 8:25:46 PM	6/30/2005 12:00:00 AM	72	63
☑ ❌ ~$pe Test 2.doc	162 Bytes	7/6/2005 9:24:17 PM	7/6/2005 9:24:18 PM	7/6/2005 12:00:00 AM	79	63
❌ Outlook.pst	328704 Bytes	5/14/2006 5:17:09 PM	5/14/2006 5:15:32 PM	5/14/2006 12:00:00 AM	83	63
❌ Outlook_recovered_by_R_...	163840 Bytes	5/13/2006 7:37:36 PM	5/13/2006 7:39:16 PM	5/13/2006 12:00:00 AM	80	63
Picture 113.jpg	3048786 By...	2/24/2009 1:42:33 PM	4/23/2007 1:13:32 PM	4/4/2011 12:00:00 AM	84	63
☑ Picture 149.jpg	1678083 By...	2/24/2009 1:43:12 PM	4/23/2007 1:15:22 PM	4/4/2011 12:00:00 AM	85	63
Picture 237.jpg	2935456 By...	2/24/2009 1:44:51 PM	4/23/2007 1:20:16 PM	4/4/2011 12:00:00 AM	86	63
test1.arc	102760448 ...	6/30/2005 11:50:27 PM	3/21/2005 8:22:26 PM	2/15/2010 11:00:00 PM	66	63
test3.arc	102760448 ...	6/30/2005 11:52:52 PM	3/21/2005 8:23:42 PM	2/15/2010 11:00:00 PM	68	63
☑ ❌ Wipe Test 1.doc	23552 Bytes	6/30/2005 11:58:04 PM	11/16/2003 10:13:14 PM	6/30/2005 12:00:00 AM	73	63
Wipe Test 2.doc	22528 Bytes	6/30/2005 11:58:04 PM	11/16/2003 10:13:20 PM	2/15/2010 11:00:00 PM	74	63
Wipe Test 3.doc	22528 Bytes	6/30/2005 11:58:04 PM	11/16/2003 10:13:26 PM	2/15/2010 11:00:00 PM	75	63
❌ Wipe Test 4.doc	22528 Bytes	6/30/2005 11:58:04 PM	11/16/2003 10:13:34 PM	6/30/2005 12:00:00 AM	76	63
❌ Wipe Test 5.doc	23040 Bytes	6/30/2005 11:58:04 PM	11/16/2003 10:14:04 PM	6/30/2005 12:00:00 AM	77	63
Wipe Test 6.doc	23040 Bytes	6/30/2005 11:58:04 PM	11/16/2003 10:14:08 PM	2/15/2010 11:00:00 PM	78	63

You may also arrange the data as required: by their extensions, creation/modification time, or as a real file structure

| Sorted by: | Real | Extensions | Creation Time | Modification Time | Access Time |

See Find and Mark Multiple Files for more details

Find Results panel

Find All "File Extensions: doc", "G: -> WDC WD75DA-00AWA107.21L07 : WD-WMA1J1262876\"
Root\Files to Recover\~$pe Test 2.doc
Root\Files to Recover\Wipe Test 1.doc
Root\Files to Recover\Wipe Test 2.doc
Root\Files to Recover\Wipe Test 3.doc
Root\Files to Recover\Wipe Test 4.doc
Root\Files to Recover\Wipe Test 5.doc
Root\Files to Recover\Wipe Test 6.doc
=== Matched 7 files and 0 folders out of total 51 files and 21 folders searched ===

Log | Find Results

Select Drive
Click this button to return to the **R-Studio** main panel to select another drive.

Reopen Drive Files
Click this button to list files again.

Recover
Click this button to recover selected folders/ files.
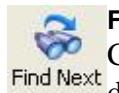
Recover Marked
Click this button to recover marked folders/ files.

Find
Click this button to find or/and mark a particular file/folder.

Find Next
Click this button to find the next object specified in the **Find/Mark** dialog box

Find Previous
Click this button to find the previous object specified in the **Find/Mark** dialog box.

File Mask
Click this button to specify a file mask.

Stop
Click this button to stop the current operation.

Up
Click this button to move highlighting one folder up.

The Log panel will show how many files and folders are on the object, and their size. You may specify which events will be shown in the log pane by setting a log filter.

Note: Metafiles are the file system's internal files invisible to any user, or file system data, which **R-Studio** represents as files. These files do not contain user data directly. Unless you want to scrutinize a disk file system, do not restore them.

If the Too many files... message appears, you may temporally stop file listing and browse through found files. Then you can resume file listing. You also may skip this file topic and continue. **R-Studio** will keep information about the entire file structure.

2   Select a file/folder to recover

You may select several files/folders in the same parent folder by pressing the **Shift** button and clicking the objects simultaneously.

⊟ *Marking multiple files/folders from different parent folders manually:*

Mark a file/folder to recover by clicking the box left to the object, or select **Mark** on the shortcut menu. You may mark several files/folders in different parent folders. You may mark all objects in the folder by selecting **Mark All** on the **Tools** or shortcut menu. To unmark an object, click the box left to the object once more or select **Unmark** on the shortcut menu. You may unmark all objects in the folder by selecting **Unmark All** on the **Tools** or shortcut menu.

The Log panel will show how many files and folders you have marked, and their total size.

R-Studio can search for a particular file. Go to the Searching for a File topic for details. If you need to find and mark many files, go to the Find and Mark Multiple Files topic for details.

File content may be previewed before recovery. Go to the Previewing Files topic for details.

If you do not find files that you want to recover:

Sometimes **R-Studio** can find the files but not the entire file paths to them. It puts such files into the **Extra Found Files** folder. Try to search for the files there. If that does not help, try to find them by using file search globally on the entire disk. Go to the Searching for a File topic for details

If you still cannot find files that you want to recover but are sure they have existed on the logical disk, you

need to use <u>Advanced Data Recovery</u> to find them.

3   Click the Recover or Recover Marked button

   ▣ *Other ways to recover selected files*

   • Right-click the selected file/folder and select **Recover** or **Recover Marked** on the shortcut menu,
or

   • Select **Recover** or **Recover Marked** on the **File** menu
or

   • Press the **F2** button.

4   Specify recover options and output folder on the Recover **dialog box and click the OK button**

Recover **dialog box**
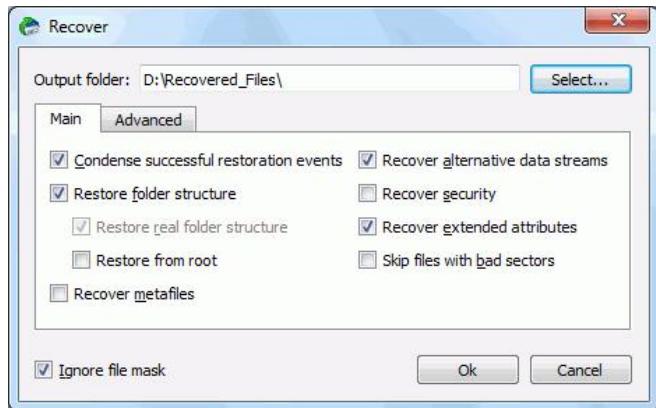
If you have another computer connected to **R-Studio** over network, the Recover dialog box will be slightly different. See **Data recovery over network** for details.

▣ *Recover options*

Condense successful restoration events	If this check box is selected, **R-Studio** will display only error and warning messages in its Log
Restore folder structure	If this check box is selected, **R-Studio** recovers the entire path to the selected object.
Restore from root	If this check box is selected, **R-Studio** recovers the entire path to the selected object starting from the root folder of the disk.
Recover metafiles	If this check box is selected, **R-Studio** recovers disk metafiles. Metafiles are the file system's internal files invisible to any user, or file system data, which **R-Studio** represents as files. These files do not contain user data directly. Unless you want to scrutinize a disk file system, do not restore them.
Recover alternative data streams	If this check box is selected, **R-Studio** recovers alternative data streams for NTFS files. Has no effect on FAT files. See **Extended Information Recovery** for details.
Recover security	If this check box is selected, **R-Studio** recovers security attributes for NTFS files. Has no effect on FAT files. See **Extended Information Recovery** for details.
Recover extended attributes	If this check box is selected, **R-Studio** recovers extended (HPFS) file attributes.

Recover real folders structure	Enabled when the files are sorted by their extensions or date. See **Find and Mark Multiple Files** for details. If this check box is selected, **R-Studio** recovers the real folders/files structure on the disk rather than that of sorted files.
Skip files with bad sectors	If this check box is selected, **R-Studio** skips files with bad sectors and displays their list on the Files with bad sectors dialog box when the recovery has been completed. You may separately decide later what to do with those files. See **Bad sectors** for details. If this check box is cleared, **R-Studio** tries to read those sectors several times (specified on the Settings/Bad Sectors dialog box), and, if fails, fills bad sectors in the recovered file with the pattern specified on the same box. Information about such files will appear in the Log.
Ignore file mask	If this check box is selected, **R-Studio** recovers all content of a selected folder, ignoring a specified **File Mask**.
Advanced	Specifies options for mass file recovery

If you want to recover multiple files at once, go to the Recover Multiple Files for more information

NEVER TRY TO SAVE RECOVERED FILES/FOLDERS TO THE SAME LOGICAL DISK WHERE THEY RESIDE!!!
Or you may obtain unpredictable results and lose all of your data.

If a file to be recovered appears to have an invalid name, a Broken File Name dialog box will appear. You may correct the name and resume file recovery.

Broken File Name **dialog box**
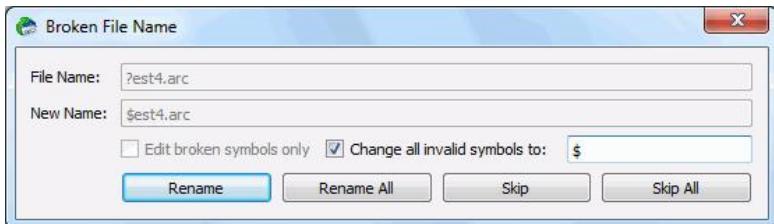
☐ ***Broken File Name properties***

File name	Shows the current incorrect file name.
New name	Field for a new file name.
Edit broken symbols only	If this check box is selected, only invalid symbols may be corrected
Change all invalid symbols to	If this check box is selected, all invalid symbols will be changed to the specified symbol
Buttons	
Rename	Click to resume file recovery
Rename All	Click to resume file recovery. All other files will be renamed according to the specified rule.
Skip	Click to skip this file
Skip All	Click to skip all files and stop file recovery

If there is no space available for the recovered files, the There is not enough space on the disk dialog box will appear. You may either select other place to store the files, skip that particular file or abort the recovery process.

There is not enough space on the disk **dialog box**
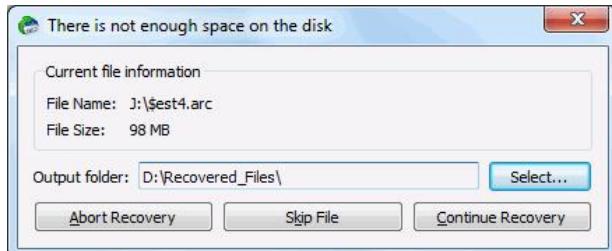
> **R-Studio will recover the selected/marked files/folders to the specified folder and show the results in the** Log **pane**

The Recovery progress indicator will show the log and progress of recovery process.

Recovery progress indicator
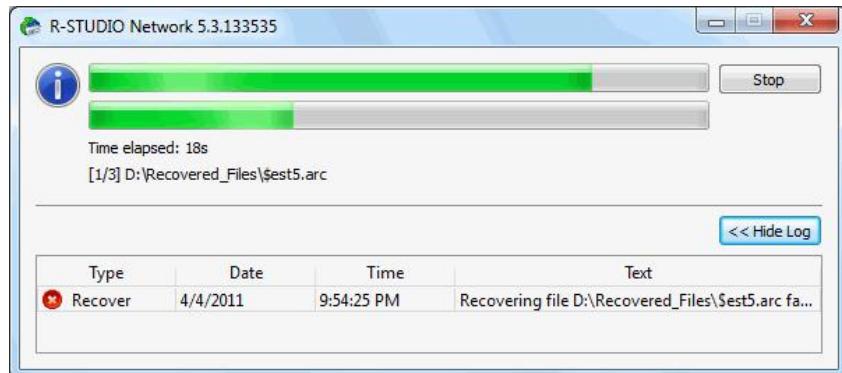
Note: R-Studio recovers files from Ext2/3/4FS partitions, but writes it to FAT or NTFS local disks. Or you may write such files to network disks. **R-Studio** successfully recovers files from Ext2/3/4FS partitions except its security attributes. **R-Studio** recovers *symlinks* as files containing the path to files which *symlinks* point to.

See **Data Recovery on HFS/HFS+ file system** for details on recovering data from disks with the HFS/HFS+ file system

Previewing Files
File Masks
Regular Expressions
Event Log
2.1.1   Searching for a File

R-Studio can find a particular file, if it is difficult to find it manually on the Folders or Files panel. You can also automatically mark/unmark all found files.

To search for a file,

1   Click the Find button

   ⊟ *Other ways to search for the file*
   • Right-click a folder and select **Find** on the shortcut menu,

or
- Select a folder and select **Find** on the **Tools** menu

2   Specify a file to be found and its options on the Find **dialog box, and click the OK button**

Note that a **File Mask** may be applied.

Find/Mark (Main) **dialog box**
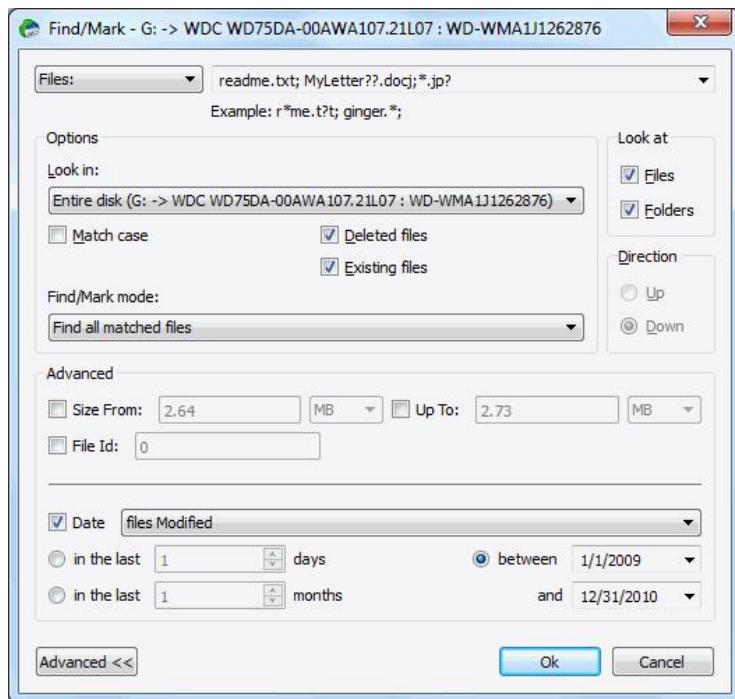
⊟ *Find/Mark options*

You may specify how to treat specified strings. Please note that **R-Studio** stores previously entered search strings.	
Files	If this option is selected, **R-Studio** treats specified strings as file names. Use ? for one unspecified character and * for an unlimited number of them to specify file masks.
File Extensions	If this option is selected, **R-Studio** treats specified strings as file extensions
Regular Expressions	If this option is selected, **R-Studio** treats specified strings as regular expressions
All Files	If this option is selected, **R-Studio** applies Advanced Options to all files.
Options	
Match case	If this check box is selected, **R-Studio** makes a case-sensitive search
Look in	Specifies where **R-Studio** searches for, and marks, files. It can look for them on the Entire disk, From current folder, In the Current folder and subfolders, and in the Current folder only. If From current folder is selected, you may also specify the Direction for the search from the current position in the current folder.
Deleted files	If this check box is selected, **R-Studio** makes a search among deleted files/folders.
Existing files	If this check box is selected, **R-Studio** makes a search among existing files/folders.
Find/Mark mode	Specifies what **R-Studio** does with the found files. It may: Find all matched files. **R-Studio** searches for all matched files. The search results

	appear on the Find Results panel. Find first matched file. **R-Studio** stops at the first found file. Mark matched files. **R-Studio** marks all found files. Unmark matched files. **R-Studio** unmarks all found files. Please note, that when performing a new find and mark/unmark task, **R-Studio** does not takes into consideration the previous marked/unmarked state of files. For example, if you first mark all doc files, and then all txt files, all doc files remain marked, too. To unmark them, you should specify doc once again and select Unmark matched files.
Look at	
Files	If this check box is selected, **R-Studio** includes files into a search.
Folders	If this check box is selected, **R-Studio** includes folders into a search.
Direction	Specifies search direction from the current position. Available only if From current folder is selected in Look in.
Advanced Options	
Size from/up to	Specifies file size limits.
File Id	Specifies File Id that **R-Studio** assigns to a file.
Date	Specifies file date boundaries. Files may be Modified/Created/Last Accessed.

> **R-Studio will show/mark the found file(s)**

If you need to find and mark many files, go to the [Find and Mark Multiple Files](#) topic for details.

To repeat the search,

* **Click the Find Next or Find Previous buttons**

    □ *Other ways to repeat the search*

     • Right-click a folder and select **Find Next** or **Find Previous** on the shortcut menu

    or

     • Select a folder and select **Find Next** or **Find Previous** on the **Tools** menu

To find all files and show them on the Find Results **panel,**

* **Select** Find all **on the on the** Find **dialog box,**

    or

    select **Find all** on the **Tools** menu

> **R-Studio will show the found files on the** Find Results **panel**

You may do the following actions on the found files:

Recover, **Mark**, **Preview**

by right-clicking the found file and selecting the appropriate item in the shortcut menu.

2.1.2   Previewing Files

R-Studio has a built-in file previewer that allows you to preview both existing and deleted files. You may use this feature to estimate recovery or a file to be recovered.

To preview a file

1   Right-click a file to preview on the Files **panel and select Preview on the shortcut menu**

   ⊟ *Other ways to preview the file*

   • Select the file on the Files panel and click the **Preview** button,

   or

   • Select the file on the Files panel and select **Preview** on the **File** menu

>   R-Studio will show the content of the file

   If you have several files open in the previewer, you may instantly close all of them by selecting **Close All Previews** on the **File** menu.

   ⊟ *List of supported file formats*

MS Office files: even without **Microsoft Office** installed
Word documents: doc (Office 97-2003) and docx
Excel spreadsheets xls (Office 97-2003) and xlsx
PowerPoint presentation ppt (Office 97-2003) and pptx
Adobe Acrobat pdf
Video/Audio files: With proper software and codecs installed in the system
Graphic files:

Format	Extension	Compression
Adobe Photoshop Document	psd	
Alias Image	pix als alias	
Amiga IFF	iff blk	Rle
Bob Ray-Tracer	bob	
CALS Raster Goup 1	cal cals	
Canon PowerShot	crw	
Casio QV-10/100 Camera	cam	
Chinon ES-1000 digital camera	cmt	
Cloe Ray-tracer	clo	
CompuServe GIF	gif giff	
DKB Ray-tracer	dis	
DPX	dpx	
Deluxe Paint, Electronic Arts	lbm	
Digital F/X	tdim graf	
EPS Interchange Format	epi	
Electric Image	ei eidi	
Encapsulated Postscript (Preview)	eps	
Explore (TDI) & Maya	tdi iff	
Gimp Bitmap	xcf	
Gimp Brush	gbr	
Gimp Icon	ico	
Gimp Pattern	pat	

Image Magick	mif miff	
Imaging Fax	g3n	
Intergraph Format	itg cit rle	
Joint Photographic Experts Group	jpg jpeg jif jfif	
Jeff's Image Format	jif	
Kodak Cineon	cin dpx	
Kodak DC120 Digital Camera	kdc	
Kodak DC25 Camera	k25	
Kodak Photo CD	pcd	
Konica Camera File	kqp	
LucasFilm Format	lff	
MTV Ray-tracer	mtv	
Macintosh Quickdraw/Pict	pic pict pct	
Mayura Draw	pdx	
Multiple Network Graphics	mng	
OS/2 Bitmap	bmp bga	Rle 4 & 8 bits
Open Image Library Format	oil	
PaintShopPro Browser Cache File	jbf	
PaintShopPro Frame	pfr	
PaintShopPro Image	psp	
PaintShopPro Mask	msk	
PaintShopPro Pattern	pat	
PaintShopPro Picture Tube	tub	
PaintShopPro Texture	tex	
Palm Pilot	pdb	
Pegs	pxa pxs	
Photopaint Image	apx	
Picture Gear Pocket	prc	
Pixar picture file	pic pxr picio pixar	
Pixibox	pxb	
Portable Bitmap	pbm rpbm	
Portable Document Format	pdf	
Portable Greyscale	pgm rpgm	
Portable Image	pnm rpnm	
Portable Network Graphics	png	
Portable Pixmap	ppm rppm	
Postscript	ps	
Psion Series 3	pic	
Psion Series 5	mbm	
Qrt Ray-tracer	qrt	

Quantel VPB	vpb	
Quicktime Picture	qtif qti	
Rayshade	pic	
Ricoh Digital Camera	j6i	
SciTex Continuous Tone	sct sc	
Seattle Film Works	sfw	
Seattle Film Works multi-image	pwp	
Sega SJ-1 DIGIO	sj1	
Silicon Graphics RGB	rgb bw iris sgi	Rle
Softimage bitmap	pic si	Rle
Sony DSC-F1 Cyber-shot	pmp	
Sony Playstation TIM PSX	tim	
Sun Icon/Cursor	icon cursor pr	
Sun Raster Images	ras rast sun sr scr rs	
Sun TAAC file format	iff vff suniff taac	
Synthetic Universe	synu syn	
TIFF Revision 6	tif tim tiff	Rle LZW LZW + Prediction
TrueVision Targa	tga pix bpx vda icb vst	Rle
Utah Raster image	Rle	
Vista	vst	
Vivid Ray-tracer	img	
Wavefront Raster file	rla rlb	
Webshots	wbc wbp wbz	
Winfax	fxs fxo	
Windows & Aldus Metafile	wmf	
Windows Bitmap	bmp rle rl4 rl8 sys	Rle 4 & 8 bits
Windows Clipboard	clp	
Windows Cursor	cur	
Windows DIB	dib	
Windows Enhanced Metafile	emf	
Windows Icon	ico	
Wireless Bitmap (level 0)	wbmp wbm wap	
X11 BitMap	xbm bm	
X11 PixMap	xpm pm	
XV Visual Schnauzer	p7	
Zsoft Multi-page Paintbrush	dcx	
Zsoft Publisher's Paintbrush	pcx pcc dcx	Rle

2.1.3   File Masks

R-Studio shows only those files/folders that match the specified file mask. File mask affects files/folders that are processed by the **Recover** and **Find** commands.
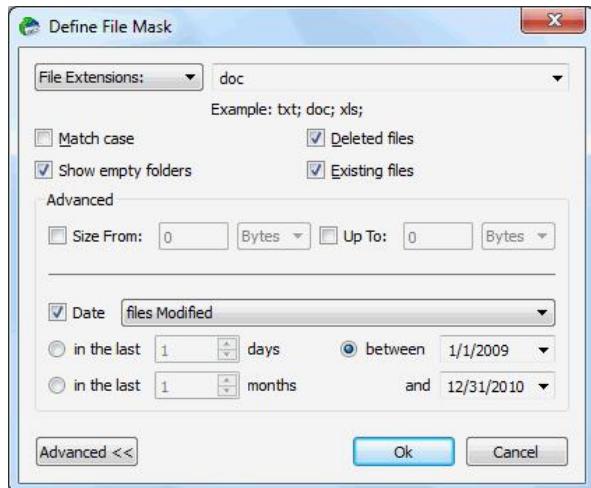
To specify a file mask,

1   Click the File Mask button

  ⊟ *Other ways to specify the file mask*
  • Right-click a folder and select **File Mask** on the shortcut menu
  or
  • Select the folder and select **File Mask** on the **Tools** menu

2   Specify the file mask on the File mask **dialog box and click the OK button**

  Mask **dialog box**

  ⊟ *File mask options*

You may specify options for All Files, File Extensions, Files, and Regular Expressions	
Match case	If this check box is selected, **R-Studio** makes a case-sensitive search.
Show empty folders	If this check box is selected, **R-Studio** will show folders with no files matching the mask.
Deleted files	If this check box is selected, **R-Studio** makes a search among deleted files/folders.
Existing files	If this check box is selected, **R-Studio** makes a search among existing files/folders.
Advanced Options	
Size from/up to	Specifies file size limits.
Date	Specifies file date boundaries. Files may be Modified/Created/Last Accessed.

> **R-Studio will show only those files that match the specified file masks**

2.1.4   Regular Expressions

Regular expression is a notation for patterns of text, as opposed to exact strings of characters. The notation uses literal characters and metacharacters. Every character which does not have special meaning in the regular-expression syntax is a literal character and matches an occurrence of that character. For example, letters and numbers are literal characters. A metacharacter is a symbol with special meaning (an operator or delimiter) in the

regular-expression syntax.

.	Wildcard: any character
*	Repeat: zero or more occurrences of previous character or class
^	Line position: beginning of line
$	Line position: end of line
[class]	Character class: any character in the set
[^class]	Inverse class: any character not in the set
[x-y]	Range: any characters within the specified range
\x	Escape: literal use of metacharacter x
\<xyz	Word position: beginning of the word
xyz\>	Word position: end of the word

For example, the following regular expression **.*** matches any string of characters, **^a** matches any string beginning with character a.

2.1.5   Event Log

R-Studio logs and displays events in the Log panel. You may set a **Log filter** to display only needed information and to write it to a log file. You may specify the log settings on the Settings dialog box.

You may clear or save the log

To clear the log,

*   **Right-click the Log panel and select Clear Log on the shortcut menu.**

To save the log to a file,

*   **Right-click the** Log **panel and select Save Log to File on the shortcut menu.**

2.2   Advanced Data Recovery

This chapter explains how to perform advanced data recovery operations.

- **Disk Scan**
- **Customizing File Types**
- **Customizing File Types-I**
- **Customizing File Types-II**
- **Regions**
- **Exclusive Regions**
- **Images**
- **Object Copy**

2.2.1   Disk Scan

In order to completely analyze data structure on an object, it must be scanned. Any object on the Drives panel can be scanned. In addition, you may create a *region* to scan only a part of an object. The **Regions** topic explains how to create and work with *regions***.**

You may select scan area and some other scan parameters. Scan information may be saved to a file and later this file may be opened.

You may save scan information on the remote computer if necessary.

Attention: Scanning large areas may be a very lengthy process!
NEVER TRY TO SAVE SCAN INFORMATION TO THE OBJECT BEING SCANNED!!!
Or you may obtain unpredictable results and lose all of your data.

To scan an object

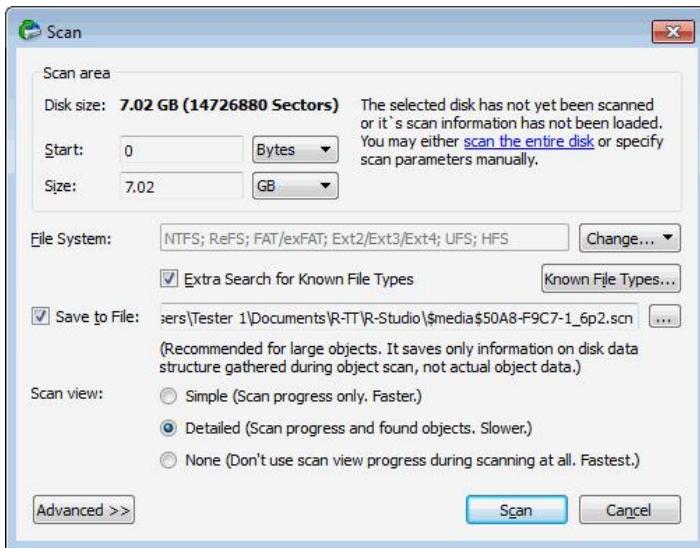**1** **Select an object on the R-Studio's Drives panel**

2 **Click the Scan button**

⊟ *Other ways to start scan*

• Right-click the selected disk and select **Scan** on the shortcut menu,

or

• Select **Scan** on the **Drive** menu

**3** **Specify the required parameters on the Scan dialog box and click the Scan button**

Scan **dialog box**

⊟ *Scan options*

| Disk Size:	Shows the size of the object to be scanned
Start:	Sets the start point of the area to be scanned.
Size:	Sets the size of the area to be scanned.
Numbers in these fields can be in bytes or sectors. If no letters are after the numbers, **R-Studio** assumes the numbers are in bytes. See **Data Formats** for more details.	
File Systems:	Specifies the file systems which objects are to be searched for. Current version supports: FAT, NTFS, exFAT, ReFS, Ext2/3/4FS, HFS, and UFS file systems. Please note that if you need to scan an HFS, HFS+, or HFSX disk, always enable the Extra search for Known File Types option. This is very important because when files are being deleted on the HFS, HFS+, HFSX file systems, the computer completely removes all system information on them, and there is no way to recover the deleted files except by using the Extra Search for Known File Types option. See **Data**

	Recovery on HFS/HFS+ file system for details.
Extra search for Known File Types	Enables search for Known File Types.
Save scan Info to File:	If this checkbox is selected, **R-Studio** will save scan information to a specified file. Later this file may be opened. Please note, that this option does not save actual disk data, only information on disk data structure gathered during disk scan.
Simple view	If this option is selected, **R-Studio** will show only scan progress.
Detailed view	If this option is selected, **R-Studio** will show graphic representation on objects found during scan.
None	If this option is selected, **R-Studio** will not show the Scan Information tab during scan.
Buttons	
Scan	Starts scanning
Advanced	Activates advanced scan options
Known File Types…	Selects file types that **R-Studio** will recognize during the disk scan.
Cancel	Closes the dialog box
NEVER TRY TO SAVE SCAN INFORMATION TO THE OBJECT BEING SCANNED!!! Or you may obtain unpredictable results and lose all of your data.	

If a remote computer is connected for **Data Recovery over Network**, the Save Scan Information File dialog box will appear when you select a place to store scan info. You may save it to the local or remote computer.
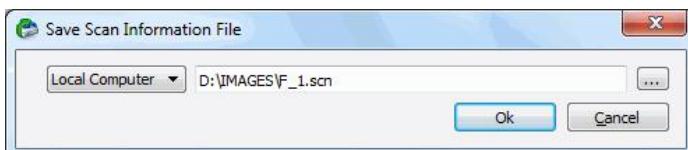
Known File Types: While scanning, **R-Studio** can recognize the data's particular file type. Using such information, **R-Studio** can obtain more information about data/file structure on the object being scanned. By default, **R-Studio** tries to recognize the default list of supported file types specified on the Known File Types tab of the Settings panel, greatly increasing time required for the scan. You may reduce it by selecting only those file types that you need. Click the **Known File Types...** button and select the required file types on the File Types dialog box. These selections will be applied to that scan session only.

File Types **dialog box**
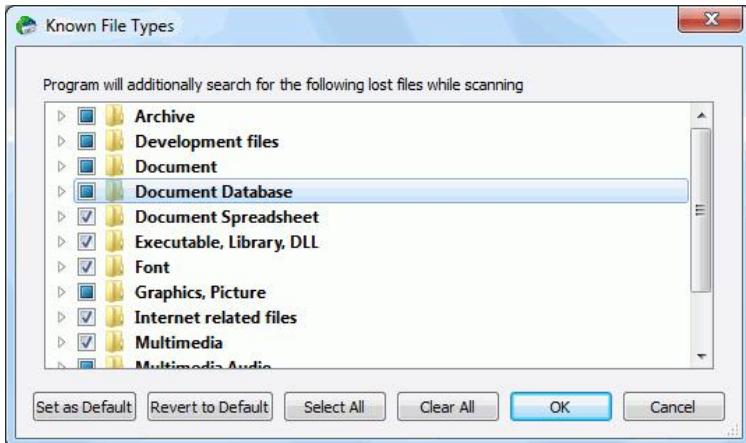
⊟ **Known File Types**

Set as Default	Click this button to set the current list of selected file types as default values.
Revert to Default	Click this button to revert the default settings specified on the Known File Types tab of the [Settings](#) panel.
Select All	Click this button to select all file types in the list.
Clear All	Click this button to clear all file types in the list except some predefined ones.

⊟ *List of known file types*

* By default, files of this type are not selected. If necessary, select them manually			
Document			
AbiWord Document: `.abw`	Adobe PDF document: `.pdf`	Final Draft Document: `.fdr`	FrameMaker Document: `.fm`
Garmin MapSource data: `.mps`	GNU Info Document: `.info`	HTML Document: `.html`	Lotus AMI Pro Document: `.sam`
Lotus Organizer Report: `.rep`	Lotus Word Pro Document: `.lwp`	Microsoft Money Data: `.mny`	Microsoft Office Open XML Document *
Microsoft OneNote section file: `.one`	Microsoft Pocket Streets Map File: `.mps`	Microsoft PowerPoint 2007 XML Document*: `.pptx`	Microsoft PowerPoint Document*: `.ppt`
Microsoft Reader eBook: `.lit`	Microsoft Reader eBook annotations: `.ebo`	Microsoft Word 2007 XML Document*: `.docx`	Microsoft Word Document*: `.doc`
Microsoft Word2 Document: `.doc`	Microsoft WordPad Document: `.wri`	OLE Storage	OpenDocument Document
PostScript document:*`.ps`	QuickBooks Backup File: *`.qbb`	QuickBooks Primary Data File: *`.qbw`	Quicken Data: *`.qdf`
Rich Text Document: `.rtf`	TEX Document: `.tex`	Text Document: `.txt`	TurboTax return file:`.tax`
Unicode Document: `.txt`	Word for Macintosh Document: `.mcw`	WordPerfect Document: `.doc`	XML Document: `.xml`

Document: Spreadsheet			
Lotus Spreadsheet: `.wks`	Lotus3 Spreadsheet: `.wk3`	Microsoft Excel 2007 XML Document*: `.xlsx`	Microsoft Excel Document*: `.xls`
Microsoft Excel2 Spreadsheet: `.xls`	Microsoft Excel3/4 Spreadsheet: `.xls`	Quattro Pro Spreadsheet: `.wq1`	
Document: Database			
Data Interchange Format file: `.dif`	dBase III Database: `.dbf`	Microsoft Access 2007 Database: `.accdb`	Microsoft Access 2007 XML Document: `.accdt`
Microsoft Access Database: `.mdb`	Microsoft Linker Database: `.lk`	Microsoft Program Database: `.pdb`	Microsoft SQL Database: `.mdf`
Microsoft SQL Log: `.ldf`	MySQL Database: `.myi`	Omnis Studio Database: `.df1`	Omnis Studio Library: `.lbs`
Internet-related files			
Compiled HTML file: `.chm`	Internet shortcut: `.url`	Microsoft OutLook Personal Folder: `.pst`	Microsoft Outlook/ Inbox offline folder: `.ost`
Mozilla Firefox browser extension: `.xpi`	Mozilla Mail Summary file: `.msf`	Outlook Express Messages: `.dbx`	The Bat! Address book: `.abd`
The Bat! Message Base: `.tbb`	The Bat! Message Index: `.tbi`	Windows Address Book: `.wab`	XML document (Unicode): `.xml`
Font			
Adobe PostScript Font: `.pfb`	Adobe Printer Font: `.pfm`	BDF Unix font	BGI font: `.chr`
CPI DOS font: `.cpi`	MyTest Font: `.mtf`	TrueType Font: `.ttf`	Windows System Font: `.fon`
Graphics/Picture			
3D XML file: `.3dxml`	3DStudio Mesh: `.3ds`	Adobe InDesign File: `.indd`	Adobe Photoshop Image: `.psd`
Agfa/Matrix Scodl Image: `.scd`	Alias Wavefront Raster Image: `.rla`	ArcView Shape: `.shp`	AutoCAD Binary Image: `.dxf`
AutoCAD Drawing: `.dwg`	AutoCAD Image: `.dxf`	Autodesc Animator Image: `.pic`	Autodesc Animator Pro color map: `.col`
Autodesc Animator Pro Image: `.pic`	Autologic Image: `.gm`	AVHRR Satellite Image: `.sst`	Bentley MicroStation CAD Drawing: `.dgn`
BMF Image: `.bmf`	Canon RAW graphics file: `.crw`	Canon RAW graphics file*: `.cr2`	Canon RAW graphics file: `.crw`
ColoRIX Image: `.rix`	CompuServe GIF Image: `.gif`	ComputerEyes Raw Image: `.cel`	Continous Edge Graphic Image: `.ceg`
Corel Texture Image: `.tex`	CorelDraw CMX Image: `.cmx`	CorelDraw Image: `.cdr`	Cubicomp Picture Maker Image

Dr. Halo palette: `.pal`	Enhanced MetaFile Image: `.emf`	Epson Stylus Image: `.prn`	Erdas LAN/GIS Image: `.lan`
Fractal Image Format: `.fif`	Freehand (MX) Database: `.fh10`	GEM Raster Image: `.img`	GEM VDI Image: `.gdi`
GOES Satellite Image: `.goe`	Graphics Workshop for Windows Thumbnail: `.thn`	Gridded Binary Image: `.grb`	Hitachi Raster Image: `.hrf`
Hotspot Image: `.shg`	HP Command Language Image: `.pcl`	HP Raster Image: `.rtl`	HSI JPEG Image: `.hsi`
IBM Picture Maker Image: `*.pic`	iPhoto Image: `.attr`	Jovian Logic Image: `.vi`	JPEG 2000: `.jp2`
JPEG Digital Camera*: `.jpg`	JPEG Image: `.jpg`	Kodak PhotoCD Image: `.pcd`	LBM/IFF Image: `.lbm`
Lightwave Object: `.lwo`	Lotus PIC Image: `.pic`	Macintosh Paint Image: `.mac`	Macintosh PICT Image: `.pct`
Microsoft Paint Image: `.msp`	Minolta RAW image: `.mrw`	Nikon RAW image*: `.nef`	Olympus RAW image: `.orf`
PaintShop Pro Image: `.psp`	PaperPort Image: `.max`	PBM Image: `.pbm`	PGM Image: `.pgm`
Pictor PC Paint Image: `.pic`	PIX Image: `.pix`	PM Image: `.pm`	PNG Image: `.png`
PPM Image: `.ppm`	Print Shop Image: `.pds`	QuarkXpress Database: `.qxp`	QuarkXPress file: `.qxd`
Quick Link II fax Image: `.qfx`	QuickDraw 3D Metafile: `.3dmf`	RenderMan Image: `.rib`	SGI Image: `.sgi`
Sigma RAW image: `.x3f`	Sketch Image: `.sk`	SmartDraw file: `.sdr`	SmartDraw template: `.sdt`
Sony RAW image: `.arw`	STAD Image: `.pac`	Sun Raster Image: `.sun`	SymbianOS Image: `.mbm`
Tagged Image Format File: `.tif`	TI Image: `.92i`	TrueVision Image: `.tga`	Utah Raster Toolkit Image: `.rle`
VITec Image: `.vit`	Windows Animated cursor: `.ani`	Windows Bitmap Image: `.bmp`	Windows cursor: `.cur`
Windows Fax Cover Image: `.cpe`	Windows icon: `.ico`	Windows MetaFile Image: `.wmf`	WordPerfect Graphics Image: `.wpg`
X PixMap Image: `.xpm`	X Window Dump Image: `.xwd`	Xara Drawing: `.xar`	ZSoft PCX Image: `.pcx`
Fuji RAW image: `.raf`			
Multimedia: Audio Files			
Advanced Streaming Format file: `.asf`	AIFF Sound: `.aif`	Amusic tracker: `.amd`	aPac Audio: `.apc`
AudioCD file: `.cda`	AVR Sound: `.avr`	CMF Music: `.cmf`	Creative Voice

			File: `.voc`
DiamondWare Sound: `.dwd`	Digital Speech File: `.dss`	Digital Voice File: `.dvf`	EA ASF/MUS Audio: `.asf`
Extended M3U playlist: `.m3u`	FLAC Audio	La Lossless Audio: `.la`	Liquid Audio: `.la1`
MIDI Instrument definition: `.idf`	MIDI Music: `.mid`	MIDI stream: `.mds`	Monkeys Audio: `.ape`
MPEG Layer I Audio: `.mpg`	MPEG Layer II Audio*: `.mp2`	MPEG Layer III Audio*: `.mp3`	MUS Music: `.mus`
Musepack Audio: `.mpc`	Next/Sun Sound: `.au`	Ogg Vorbis Audio: `.ogg`	OptimFROG Audio: `.ofr`
RIFF MIDI Music: `.rmi`	RK Audio Sound: `.rka`	Sierra AUD Sound: `.aud`	Sony OpenMG Audio: `.oma`
Super NES Audio: `.spc`	TTA Audio: `.tta`	VQF Sound: `.vqf`	WavPack Audio: `.wv`
Westwood AUD Sound: `.aud`	Windows Audio Compression Manager driver: `.acm`	Windows Media Audio: `.wma`	Windows WAVE Sound: `.wav`
X-MIDI Music: `.xmi`	ZyXEL Sound: `.zyx`		
Multimedia: Video Files			
3GPP multimedia audio/video: `.3gp`	3GPP2 multimedia audio/video: `.3g2`	4X Movie Video: `.4xm`	Adobe Filmstrip Animation: `.fsf`
AMV Video: `.amv`	ANIM Animation: `.cel`	Autodesk Animator: `.fli`	BCS Video: `.bcs`
BINK Video: `.bik`	DeluxePaint Animation: `.anm`	Director Video: `.dcr`	DriveCam Video: `.dce`
DVM Video: `.dvm`	Eyemail Video: .eye	Flash Video: `.flv`	Google Video: `.gvi`
Intel DVI Video: `.dvi`	Intel Indeo Video File: `.ivf`	Interplay MVE Video: `.mve`	Lotus ScreenCam Video: `.scm`
LZA Animation: `.lza`	MPEG Video: `.mpg`	Nancy Codec Video: `.noa`	NEOchrome Animation: `.ani`
Nullsoft Video: `.nsv`	NuppelVideo (MythTV) Video: `.nuv`	QuickTime Video: `.mov`	QV-10 Video: `.cam`
RPL Video: `.rpl`	Sega FILM/CPK Video: `.cpk`	SGI movie format: `.mv`	Shockwave Video: `.swf`
Smacker Video: `.smk`	SMJPEG Video: `.mjpg`	Sony Movie Player Video: `.mqv`	VideoCD MPEG: `.dat`
VideoCD Video: `.vcd`	Vivo streaming Video: `.viv`	VOB video files: `.vob`	VP6 encoded Video: `.vp6`
Windows AVI Video: `.avi`	Windows Media Video: `.wmv`		
Multimedia Files			
Material Exchange	MP4 file: `.mp4`	Real Networks audio/	RIFF Multimedia File

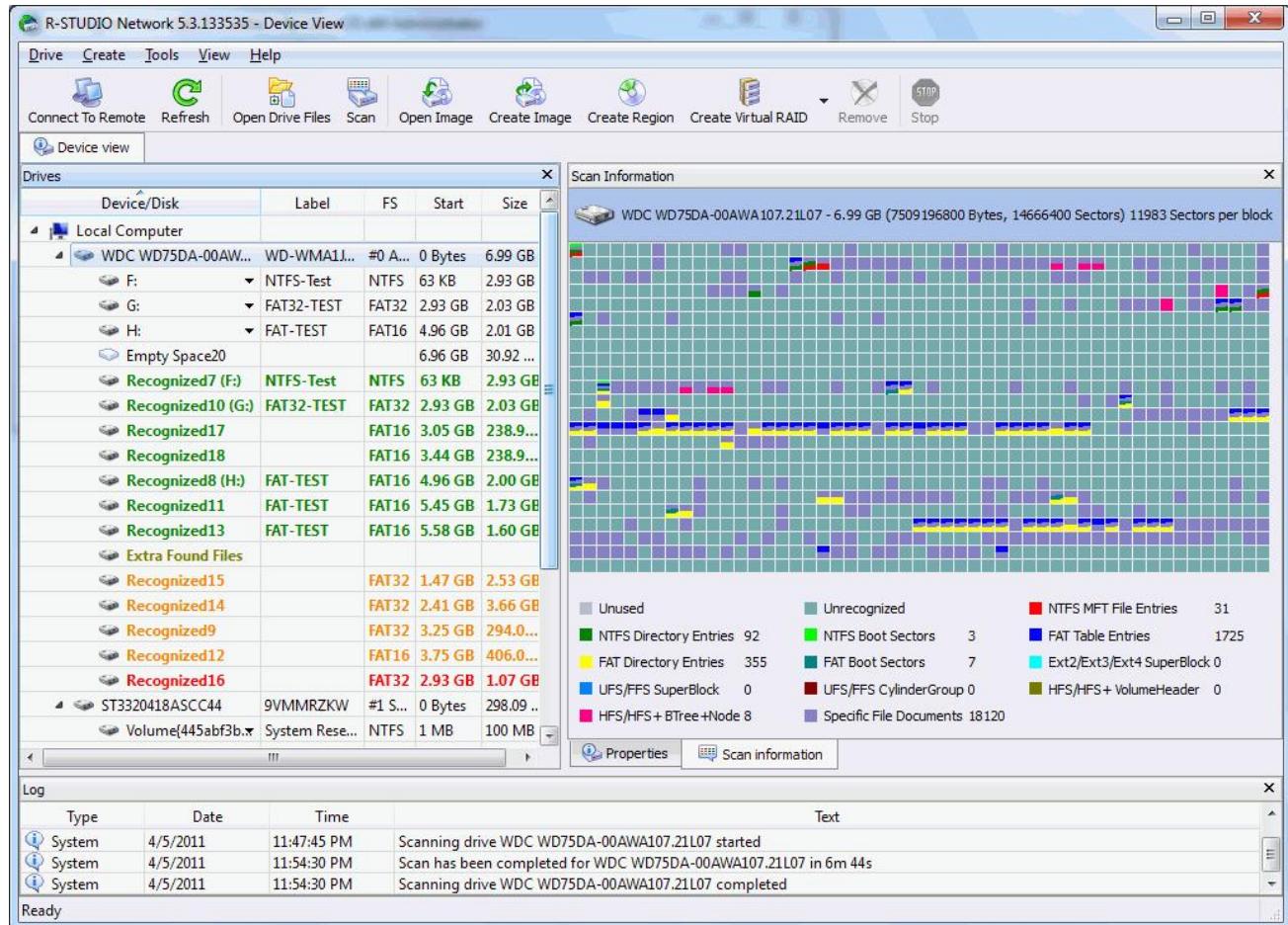|			
File: `.mxf`		video: `.rm`	
Archive Files			
7-Zip archive: `.7z`	ACE archive: `.ace`	AIN archive: `.ain`	ARJ archive: `.arj`
ARX archive: `.arx`	Aladdin Systems StuffIt archive: `.sit`	BAG archive: `.bag`	BIX archive: `.bix`
BOA archive: `.b58`	BZip2 archive: `.bz2`	BlackHole archive: `.bh`	Blink archive: `.bli`
CPIO archive: `.cpio`	CRUSH archive	ChArc archive: `.chz`	Compress archive: `.z`
FOXSQZ archive: `.sqz`	GZip archive: `.gz`	HA archive *: `.ha`	HAP archive: `.hap`
HPACK archive: `.hpk`	Hyper archive: `.hyp`	InstallShield Cabinet archive: `.cab`	InstallShield Data archive: `.z`
InstallShield archive	JAM archive: `.jam`	JAR archive: `.jar`	JRC archive: `.jrc`
LHA/LZARK archive: `*.lzh`	LIMIT archive: `*.lim`	LZA archive: `*.lza`	LZOParchive: `.lzo`
LZSH archive	LZX archive: `.lzx`	Microsoft Cabinet archive: `.cab`	Microsoft Compress 5 archive
Microsoft Compress 6 archive	PAKLEO archive: `.pll`	Pack archive *	QFC archive: `.qfc`
Quantum archive *: `.ark`	Quark archive	RAR archive: `.rar`	RPM archive: `.rpm`
ReSOF archive: .sof	SAR archive: `.sar`	SBC archive: `.sbc`	SCO archive *
SQZ archive: `.sqz`	SZip archive	StuffIt archive: `.sit`	TAR archive: `.tar`
UFA archive: `.ufa`	UHArc archive: `.uha`	UltraCompressor 2 archive: `.uc2`	UltraCrypt 2 archive: `.ue2`
WIN-Freeze archive*: `.ice`	WRAptor archive: `.wra`	WinImp archive: `.imp`	YAC archive: `.yc`
YBS archive: `.ybs`	ZIP archive: `.zip`	ZOO archive: `.zoo`	ZZip archive: `.zz`
Apple Safari Web Archive: `.webarchive`	Microsoft Internet Explorer Web Archive: `.mht`	R-Drive Image Archive: `.arc`	R-Drive Image V1 Archive: `.arc`
WinImage Archive: `*.imz`			
Executable/Library/DLL			
DOS Style Executable: `.exe`	ELF Executable (UNIX)	ELF Library (UNIX)	ELF Module (UNIX)
Java Bytecode: `.class`	Novell NetWare executable: `.nlm`	RDOFF executable	Win32 DLL*: `.dll`
Win32 Executable*: `.exe`	Windows OCX File: `.ocx`		
Development files			
Borland Delphi 6 Library: `.dcu`	Borland Turbo Pascal compiled Unit: `.tpu`	COM Type Library: `.tlb`	Delphi 7 Compiled Unit: `.dcu`
Library: `.lib`	Microsoft .NET XML	Microsoft ClassWizard	Microsoft Linker

	Resource template: `.resx`	file: `.clw`	database
Microsoft Precompiled header: `.pch`	Microsoft Visual C++ Database: `.mdp`	Microsoft Visual Studio Database: `.dsp`	Microsoft Visual Studio Solution: `.sln`
Microsoft Program database	Microsoft Visual C++ project	Microsoft Visual Studio project	Microsoft Visual Studio workspace: `.dsw`
OMF Object library: `.lib`	VisualBasic Database: `.vbp`	Windows Compiled resource (16bit) *: `.res`	Windows Compiled resource (32bit): `.res`
Other file types			
ABBYY Lingvo dictionary: `.lsd`	File Crypt file: `.rzx`	Kaspersky Anti-virus data base: `.avc`	NOD32 Antivirus Update file: `.nup`
OziExplorer Map data: `.map`	RegEdit file: `.reg`	RegEdit file (UNICODE): `.reg`	Windows Backup File: `.bkf`
Windows Clipboard file: `.clp`	Windows Color Profile: `.icm`	Windows Minidump	Windows National locale: `.nls`
Windows Password file: `.pwl`	Windows Policy file: `.pol`	Windows Registry file: `.dat`	Windows Registry hive: `.hiv`
Windows shortcut: `.lnk`	WinHelp: `.hlp`	WinHelp Contents: `.cnt`	
Unreal Package	Java Applet cache index	Android Package	MySQL Database Dictionary
CrystalMaker Data File	AIX Backup File	Kaspersky Anti-Virus signature base	Audacity audio
PolySpace results	Kaspersky Anti-Virus database	ArtMoney Table file	D-LIB bytecode
Valve Texture File	Fallout 3 save game	PlayStation 3 Theme	OS/2 Icon
ACUCOBOL object	WinXP Prefetch file	XPCOM Type Library	iOS Package
Common Loudspeaker Binary			

Note: Using scan for Known File Types, **R-Studio** can successfully recover only un-fragmented files.
You may also specify your own file types for scanning. See **Customizing File Types** for details. User-defined file types precede over built-in ones, if their definitions overlap.
You may set the defaults for known file types on the **R-Studio Settings**.

> **R-Studio** starts scanning the object, and its panel will show information about new found objects:

  R-Studio Main panel

Drives panel after scanning:
You can select an object by clicking on it

The Log pane will show scan progress. Scan may be stopped by clicking the **Stop** button on the toolbar. Later the scan process may be resumed with different scan parameters.

You may see which file object(s) is/are on a particular disk part. Click the corresponding rectangle on the Scan Information pane and view the information on the Scan Information dialog box.

Scan Information **dialog box**
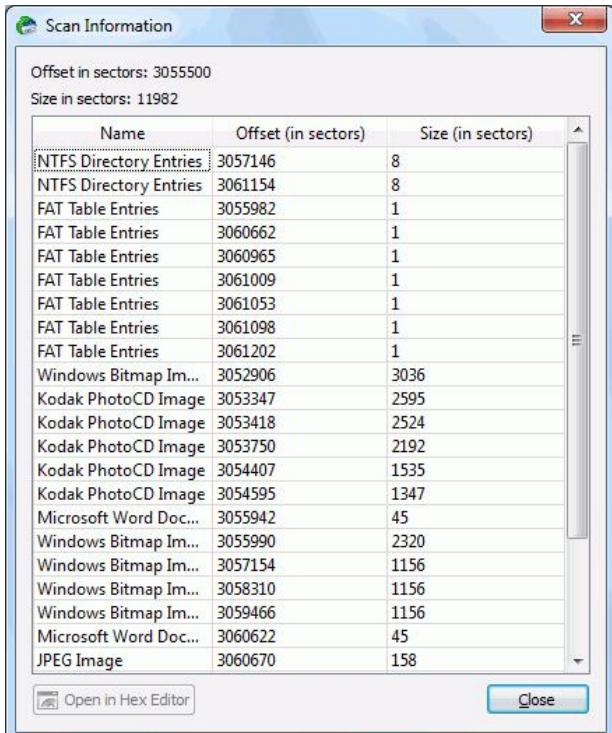
Double-click an object to view/edit the file object in the **Text/hexadecimal editor**.

When an object is scanned, a number of Recognized partitions will appear. **R-Studio** shows them in different colors depending on which elements of the partition have been found.

F:	An existing logical disk or partition
Recognized2	Both boot records and file entries are found for this partition
Recognized1	Only file entries are found for this partition
Recognized3	Only boot records are found for this partition
Empty Space21	Empty space on the object
Extra Found Files	Files that have been found using scan for known file types.

Although such recognized partitions are virtual objects, files can be searched for and recovered from recognized partitions as from real logical disks using Basic File Recovery.

To see the information about a newly found object, simply click it on the Drives panel. Click this link to see the information about the object Recognized17 on the logical disk H:.

Properties		✕
Name	**Value**	
Drive Type	Partition	
Name	Recognized17	▶
Size	3.94 GB (8268241 Sectors)	▶
Partition Offset	3.05 GB (6398159 Sectors)	▶
Partition Size	3.94 GB (8268241 Sectors)	▶
◢ **Recognized FS**		
Parsed Boot Records	1	
Parsed File Entries	1	
Estimated Size	238.98 MB (489440 Sectors)	▶
◢ **FAT Information**		
FAT Bits (12,16,32)	16	▼
Cluster Size	4 KB (8 Sectors)	▼
First Cluster Offset	247.50 KB (495 Sectors)	▶
Root Directory Offset	245248	▶
Root Directory Length	16 KB	▶
First FAT Offset	512 Bytes (1 Sectors)	▶
Size of One FAT Table	119.50 KB (239 Sectors)	▶
Number of FAT Copies	2	▶
Active FAT copy	Auto	▼

All scanned information may be deleted on the shortcut menu for a scanned object.

Scan information may be saved in a file. Previously saved scan information may be loaded. This can be done on the **Drive** or shortcut menu for a selected object.

Multiple scans

If the selected object has been completely scanned, you may rescan it either completely or with new scan parameters. If the selected object has been scanned partially, you may scan the rest of the object, ignore the existing scan information and scan the entire object, or specify scan parameters manually.

R-Studio accumulates the information from successive scans and keeps track of changes in this information obtained from different scans.

You may make several scans of successive or overlapping areas. Click the **Advanced** button, specify an offset and size for a new area to scan on the Advanced Scan dialog box and click the **Add** button. You may specify and add several scan areas. You may select which areas should be scanned. Selected scan areas can be merged. Right-click a necessary area and select either **Merge Down**, **Merge Down All**, and **Merge Selected**.

Advanced Scan **dialog box**
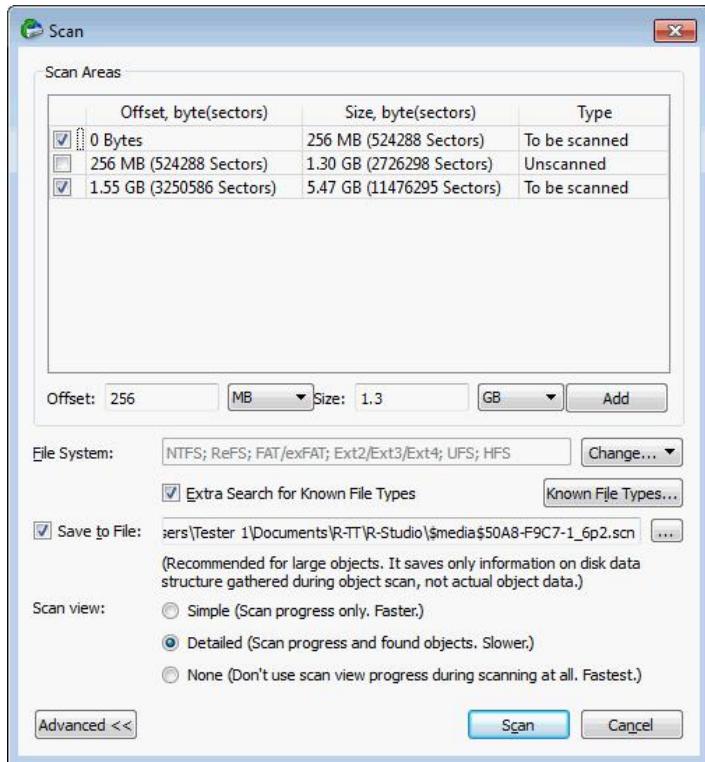
Managing scan information

Scan information may be saved to a file. Previously saved scan information may be loaded.

To save scan information

1 **Select an object on the R-Studio** Drives **panel**

2 **Select Save Scan Information on the Drive or shortcut menu and save the scan information in a file**

The default file extension is *.scn.

If a remote computer is connected for **Data Recovery over Network**, the Save Scan Information File dialog box will appear when you select a place to store scan info. You may save it to the local or remote computer.

To load scan information

1 **Select an object on the R-Studio** Drives **panel**

2 **Select Open Scan Information on the Drive or shortcut menu and select the required file with the scan information**

The default file extension is *.scn.

If a remote computer is connected for **Data Recovery over Network**, the Open Scan Information File dialog box will appear when you select a place to load scan info from. You may load it from the local or remote computer.
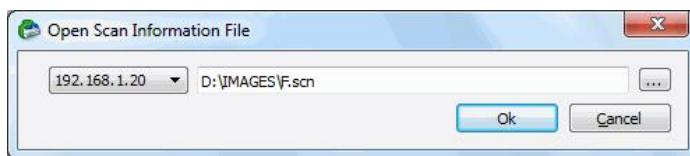
> **The scan information will appear in the** Drives **panel**

To remove scan information

1   **Select an object on the R-Studio** Drives **panel**

2   **Select Remove Scan Information on the Drive or shortcut menu**

> **The scan information will disappear from the** Drives **panel**

NEVER TRY TO SAVE SCAN INFORMATION ON THE OBJECT BEING SCANNED!!!
Or you may obtain unpredictable results and lose all your data.

2.2.2   Customizing File Types

You may create your own known file types and add their file signatures for scanning in Known File Types. They will appear in their respective folders on the File Types dialog box.

You can do that either by using the **R-Studio's** graphic interface or by direct editing the known file description file specified on the **R-Studio** Main settings dialog box.

Creating a Known File Types using a Graphic User's Interface

The easiest way to add your own is to use the **R-Studio's** graphic interface.

To create a Known File Type,

1   **On the** Main **settings dialog box, click the Edit User's File Types... button**

> **The** Edit User's File Types **dialog box will appear**

Edit User's File Types **dialog box**
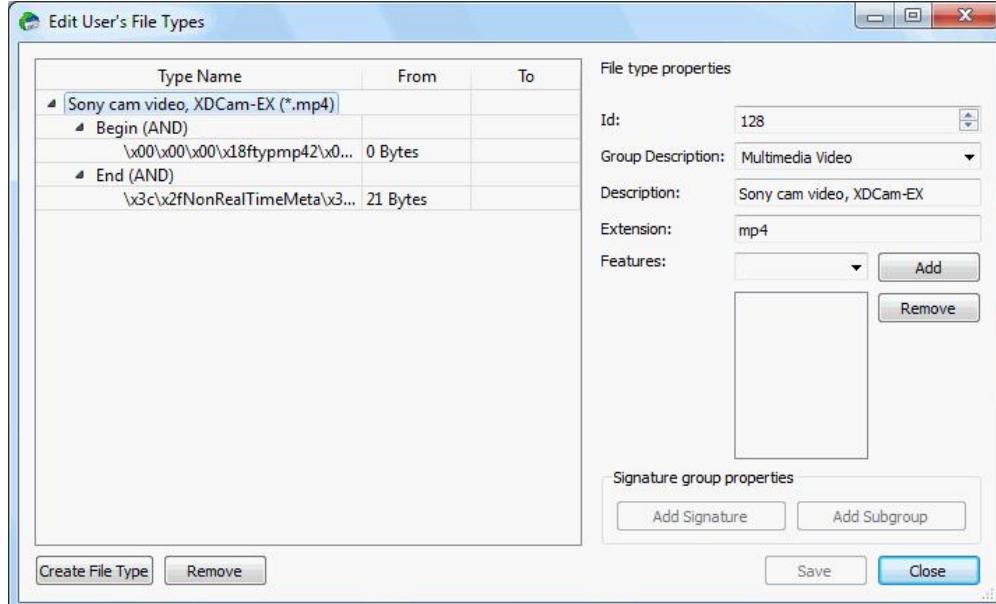
2 **Click the Create File Types button and specify File type properties**

Edit User's File Types **dialog box**

☐ *File Types properties*

id	digit	Required	Digital file type identifier. Should be unique for each custom file type.
group	string	Optional	Specifies a file type group in which found files will appear. You may specify either your own groups or select those predefined on the File Types dialog box.
description	string	Optional	Brief file description
features	NO_SCAN TXT_ANSI TXT_UNICODE	Optional	Additional properties of the file type. If you want to specify several properties, they should be separated by a space. NO_SCAN: Not to be scanned for. If this flag is used, **R-Studio** will not search for such file type. Such files will be shown when sorting files by their extensions. TXT_ANSI: The file can be viewed as ANSI text. If this flag is specified, the file can be correctly represented as an ANSI text. When previewing, this file will be immediately sent to **Text/ hexadecimal editor**. TXT_UNICODE: The file can be viewed as UNICODE text. If this flag is specified, the file can be correctly represented as a UNICODE text. When previewing, this file will be immediately sent to **Text/hexadecimal editor**.
extension	<string>	Optional	File extension.

3 Click the Add Signature button, specify the signature parameters, and click the Save button

Edit User's File Types **dialog box**
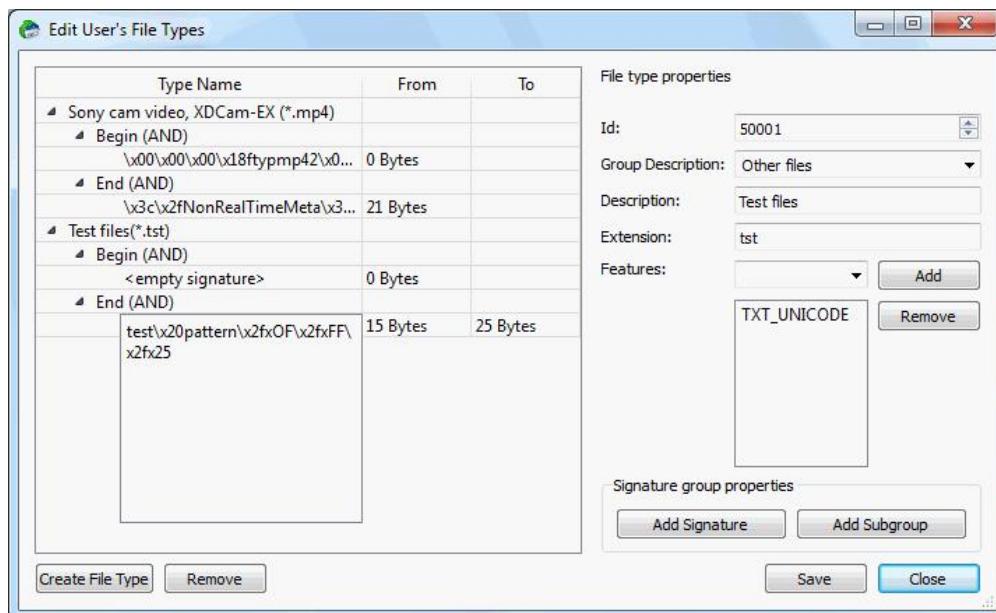
File signature properties

Begin End	Specifies from where the signature begins. If End, the offset is from the end of file to the first byte of the signature. That is, if the signature is two bytes long, the offset value should be 2.
AND OR	Shows the order of the logical operation (union or intersection)
From	A decimal number specifying the leftmost possible offset for the file signature.
To	A decimal number specifying the rightmost possible offset for the file signature.

You may specify as many signatures as you need. Moreover, you may specify subgroups within a signature using the **Add Subgroup** button. The structure of such possible subgroups is described on the Customizing File Types-II help page.

> **The newly specified file type will appear on the** Edit User's File Types **dialog box and the** File Types **dialog box**

Edit User's File Types **dialog box**
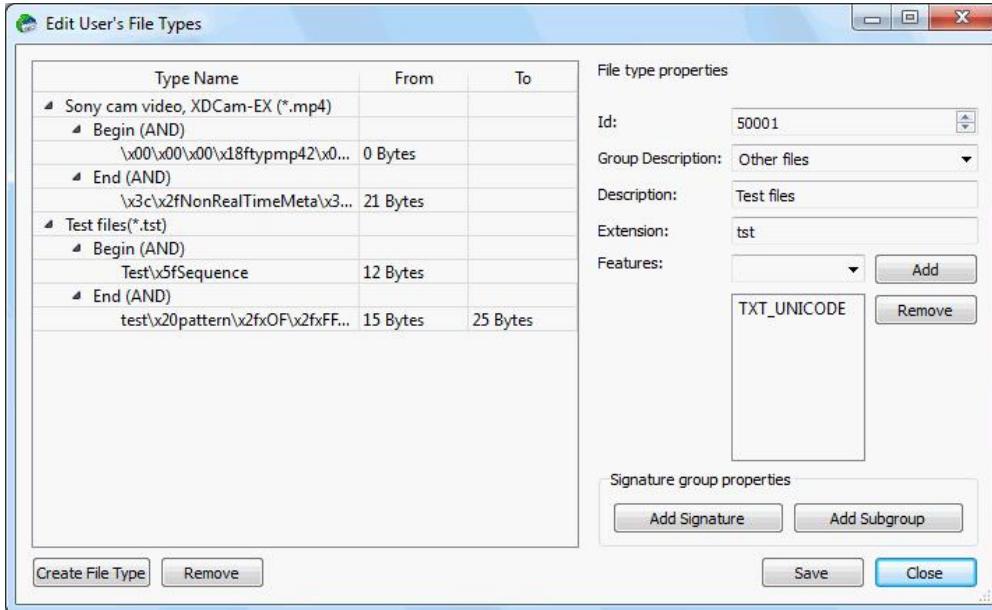
2.2.3 Customizing File Types-I

The syntax of signature description is similar to that of the XML language. They are stored in the file specified on the **R-Studio** Main settings dialog box.

More advanced features are described in **Customizing File Types-II.**

Signature file example

```
<?xml version="1.0" encoding="utf-8"?>
  <FileTypeList>
    <FileType id="2" group="archive" description="ARJ Archive" extension="arj">
      <Signature offset="3" count="1">Abc\x5c\x00\x04</Signature>
      <Signature offset="9" count="2">\x23\x01\xf4</Signature>
    </FileType>
  </FileTypeList>
```

File structure

File header

The file starts with a standard XML header

```
<?xml version="1.0" encoding="utf-8"?>
```

Section `FileTypeList`

```
<FileTypeList>
```

It requires a closing element `</FileTypeList>`.

Section `FileType`

This is a description of each file signature.

Attributes:

id	<u32>	Required	Digital file type identifier.	

			Should be unique for each file type.	
group	`<string>`	Optional	Specifies a file type group in which found files will appear. You may specify either your own groups or those predefined on the File Types dialog box.	Default: `unknown`
description	`<string>`	Optional	Brief file description	Default: `null` (no description)
features	`NO_SCAN` `TXT_ANSI` `TXT_UNICODE`	Optional	Additional properties of the file type. If you want to specify several properties, they should be separated by a space.	Default: `0`
extension	`<string>`	Optional	File extension.	Default: `null` (no extension)

File type properties flags

`NO_SCAN`	Not to be scanned for. If this flag is used, **R-Studio** will not search for such file type. Such files will be shown when sorting files by their extensions.
`TXT_ANSI`	The file can viewed as ANSI text. If this flag is specified, the file can be correctly represented as an ANSI text. When previewing, this file will be immediately sent to **Text/ hexadecimal editor**.
`TXT_UNICODE`	File can viewed as UNICODE text. If this flag is specified, the file can be correctly represented as a UNICODE text. When previewing, this file will be immediately sent to **Text/hexadecimal editor**.

This section can contain an unlimited number of the `Signature` elements. If there are several `Signature` elements, that means that all those signatures are simultaneously present in the file. Such signatures should have different `offset` attributes and they should not overlap.

Element `Signature`

The element contains a string value of the file signature consisting of ASCII characters and hex bytes in the `\xhh` format, where `hh` is a hexadecimal byte code. If there is not a hexadecimal number after `\x` , `\x` are treated as a part of the string section of the signature

Attributes:

offset	`<u16>`	Optional	Decimal offset for the signature	Default: `0`
count	`<u16>`	Optional	Decimal number specifying the number of signatures of the same length. Used when several signatures of the same length starting with the same offset can be present in a file. In this case they should be sequentially written in the element, and the `size` attribute specifies the length of signature. `count*size` should be equal to the number of	Default: `1`

			bytes in the element. If only one signature can be on this offset, `count` should be equal `"1"`, and `size` should be equal to the length (the number of bytes) of the signature.	
size	`<u16>`	Optional	Decimal number specifying the number of bytes in the signature.	Default: the number of bytes written in the element.
from	begin end	Optional	Specifies from where the `offset` is calculated. If `end`, the `offset` is from the end of file to the first byte of the signature. That is, if the signature is two bytes long, the `offset` value should be `2`.	Default: `begin`

Comments

```
<!-- Comment string -->
```
An XML standard string for a comment.

2.2.4   Customizing File Types-II

Currently **R-Studio** supports two versions of file type descriptions. Version 2 extends legacy Version 1 by adding variable signature offsets and `AND/OR` combination of several signatures in one file type. The version of file type description is specified by the version attribute of the `FileTypeList` section . Version 1 is the default option.

File structure

Elements common to Versions 1 and 2 of file type description

File header

The file starts with a standard XML header
```
<?xml version="1.0" encoding="utf-8"?>
```

Section `FileTypeList`
```
<FileTypeList>
```

Attributes:

version	1.0 2.0	Optional	Version of file type description	Default: `1.0`

It requires a closing element `</FileTypeList>`.

Comments

```
<!-- Comment string -->
```
An XML-standard string for a comment.

Version 1 of file type description

Signature file example

```
  <FileTypeList>
    <FileType id="2" group="archive" description="ARJ Archive" extension="arj">
```

```
        <Signature offset="3" count="1">Abc\x5c\x00\x04</Signature>
        <Signature offset="9" count="2">\x23\x01\xf4</Signature>
    </FileType>
  </FileTypeList>
```

Section `FileType`

This is a description of each file signature.

Attributes:

id	`<u32>`	Required	Digital file type identifier. Should be unique for each file type.	
group	`<string>`	Optional	Specifies a file type group in which found files will appear. You may specify either your own groups or those predefined on the <u>File Types</u> dialog box. See the table below.	Default: `unknown`
description	`<string>`	Optional	Brief file description	Default: `null` (no description)

features	`NO_SCAN`
	`TXT_ANSI`
	`TXT_UNICODE`
		Optional	Additional properties of the file type. If you want to specify several properties, they should be separated by a space.	Default: `0`

extension	`<string>`	Optional	File extension.	Default: `null` (no extension)

File type properties flags

`NO_SCAN`	Not to be scanned for. If this flag is used, **R-Studio** will not search for such file type. Such files will be shown when sorting files by their extensions.
`TXT_ANSI`	The file can be viewed as ANSI text. If this flag is specified, the file can be correctly represented as an ANSI text. When previewing, this file will be immediately sent to **Text/hexadecimal editor**.
`TXT_UNICODE`	The file can be viewed as UNICODE text. If this flag is specified, the file can be correctly represented as a UNICODE text. When previewing, this file will be immediately sent to **Text/hexadecimal editor**.

List of predefined file type groups

Group	Name on the File Types dialog box.
archive	Archive Files
graphics	Graphics/Picture
internet	Internet-related files
multimedia	Multimedia Files
audio	Multimedia: Audio Files
video	Multimedia: Video Files
font	Font
document	Document
doc_database	Document: Database

doc_sheet	Document: Spreadsheet
exe	Executable/Library/DLL
unknown	Other file types

This section can contain an unlimited number of the `Signature` elements.If there are several `Signature` elements, that means that all those signatures are simultaneously present in the file. Such signatures should have different offset attributes and they should not overlap.

Element `Signature`

The element contains a string value of the file signature consisting of ASCII characters and hex bytes in the `\xhh` format, where `hh` is a hexadecimal byte code. If that is not a hexadecimal number after `\x`, `\x` are treated as a part of the string section of the signature

Attributes:

offset	`<u16>`	Optional	Decimal offset for the signature	Default: `0`
count	`<u16>`	Optional	Decimal number specifying the number of signatures of the same length. Used when several signatures of the same length starting with the same offset can be present in a file. In this case they should be sequentially written in the element, and the `size` attribute specifies the length of signature. `count*size` should be equal to the number of bytes in the element. If only one signature can be on this offset, count should be equal to "`1`", and size should be equal to the length (the number of bytes) of the signature.	Default: `1`
size	`<u16>`	Optional	Decimal number specifying the number of bytes in the signature.	Default: the number of bytes written in the element.
from	begin end	Optional	Specifies from where the offset is calculated. If end, the offset is from the end of file to the first byte of the signature. That is, if the signature is two bytes long, the offset value should be `2`.	Default: `begin`

Version 2 of file type description

Signature file example

```
<?xml version="1.0" encoding="utf-8"?>
<FileTypeList version="2.0">
  <FileType id="5626" group="_Test" description="Test file" extension="tst">
    <Begin combine="and">
      <Signature from="0" to="20">ABC</Signature>
      <Signature offset="1">CDEFG</Signature>
      <AND>
        <Signature offset="0">DE</Signature>
```

```
        <Signature offset="0">RTD</Signature>
        <OR>
          <Signature offset="12">CP</Signature>
          <Signature offset="16">RTD</Signature>
        </OR>
      </AND>
    </Begin>
    <End combine="or">
      <Signature from="3" to="20">ABC</Signature>
      <Signature offset="5">CDEFG</Signature>
      <AND>
        <Signature offset="2">DE</Signature>
        <Signature offset="3">RTD</Signature>
        <OR>
          <Signature offset="12">CP</Signature>
          <Signature offset="16">RTD</Signature>
        </OR>
      </AND>
    </End>
  </FileType>
</FileTypeList>
```

Section `FileType`

This is a description of each file signature.

Attributes:

Similar to those in Version 1.

The section can contain one element `Begin` and one `End`. It should contain at least one of them.

Example

```
<FileTypeList version="2.0">
  <FileType id="2" group="archive" description="ARJ Archive" extension="arj">
    <Begin [attributes]>
      ...
    </Begin>
    <End [attributes]>
      ...
    </End>
  </FileType>
</FileTypeList>
```

Sections `Begin` **and** `End`

Specify the positions of file type signatures in the file.

Attributes

combine	and or	Optional	Shows the order of the logical operation (union or intersection)	Default: and

These sections can contain one of several elements `Signature`. And one or several elements `OR` or `AND`. If there are several elements inside the section they are combined according to the attribute `combine`.

Example:

```
<FileTypeList version="2.0">
  <FileType id="2" group="archive" description="ARJ Archive" extension="arj">
    <Begin combine="or">
```

```
        <Signature [attributes]> ... </Signature>
        ...
        <Signature [attributes]> ... </Signature>
        <AND>
          ...
        </AND>
        <OR>
          ...
        </OR>
      </Begin>
      <End>
        <OR>
          ...
        </OR>
        <Signature [attributes]> ... </Signature>
        ...
        <Signature [attributes]> ... </Signature>
      </End>
    </FileType>
  </FileTypeList>
```

Sections AND **and** OR

These sections can contain one of several elements Signature. And one or several elements OR or AND. If there are several elements inside the section they are combined according to the section type (logical AND or OR).

Example:

```
<FileTypeList version="2.0">
  <FileType id="2" group="archive" description="ARJ Archive" extension="arj">
    <Begin>
      <Signature [attributes]> ... </Signature>
      ...
      <Signature [attributes]> ... </Signature>
      <AND>
        <Signature [attributes]> ... </Signature>
        <OR>
          <Signature [attributes]> ... </Signature>
          <AND>
            <Signature [attributes]> ... </Signature>
            <Signature [attributes]> ... </Signature>
          </AND>
          <OR>
            <Signature [attributes]> ... </Signature>
            <Signature [attributes]> ... </Signature>
          </OR>
        </OR>
        <Signature [attributes]> ... </Signature>
      </AND>
    </Begin>
  </FileType>
</FileTypeList>
```

Element Signature

The element contains a string value of the file signature consisting of ASCII characters and hex bytes in the \xhh format, where hh is a hexadecimal byte code. If that is not a hexadecimal number after \x, \x are treated as a

part of the string section of the signature

Attributes:

offset	`<u16>`	Optional	Decimal offset for the signature	Default: `0`
from	`<u16>`	Optional	Decimal number specifying the leftmost possible offset for the file signature. Ignored if the `offset` attribute is specified.	Default: undefined
to	`<u16>`	Optional	Decimal number specifying the rightmost possible offset for the file signature. Ignored if the `offset` attribute is specified.	Default: undefined
size	`<u16>`	Optional	Decimal number specifying the number of bytes in the signature.	Default: the number of bytes written in the element.

Example:

```
<FileTypeList version="2.0">
  <FileType id="2" group="archive" description="ARJ Archive" extension="arj">
    <Begin>
      <Signature offset="3">Abc\x5c\x00\x04</Signature>
      <Signature from="9" to="15">\x23\x01\xf4</Signature>
    </Begin>
  </FileType>
</FileTypeList>
```

2.2.5   Regions

Scanning large objects may take a long time. Sometimes, only a smaller area of a disk needs to be scanned or searched for files. Such area is called a *region*. A region can be created on any object in the **R-Studio**'s Drives panel.

Created regions can be scanned, and files on them can be recovered in the same way as from hard drives or logical disks.

Created regions can be deleted or their size can be changed.

Note: R-Studio does not create anything real on the disk. Regions are virtual objects that do not affect actual data on the disk.

To create a *region*

1   **Select an object on the R-Studio's** Drives **panel and click the Create Region button**

    ⊟ *Other ways to create the region*

    • Right-click the selected object and select **Create Region** on the shortcut menu

    or

    • Select the object and select **Create Region** on the **Create** menu

    or

    • Select the object and press the **F4** key on the keyboard

2 **Specify required parameters on the** Create region **dialog box and click the** C**reate button**

Create region **dialog box**
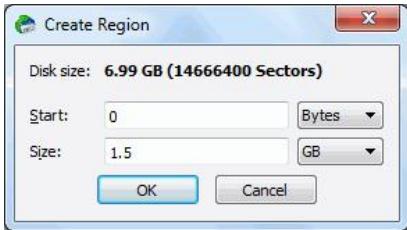
□ *Region options*

Disk size:	Shows size of the object where the region is to be created. The region cannot be larger than this size.
Start:	Start point of the region
Size:	Size of the region. Cannot be larger than Disk size.
Numbers in these fields can be in bytes or sectors. If no letters are after the numbers, **R-Studio** assumes the numbers are in bytes. See **Data Formats** for more details.	

> **A Region object will appear on the** Drives **panel.**
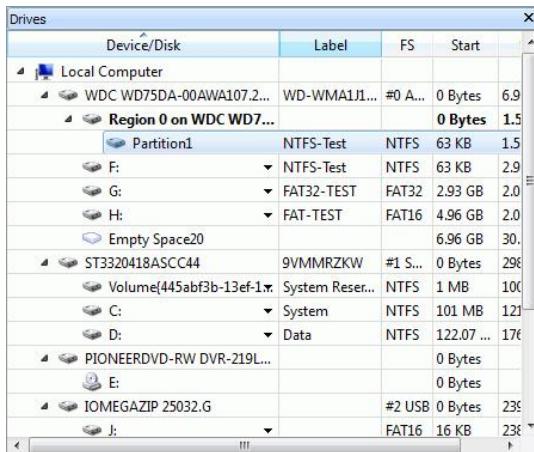
To remove a region

* **Select a Region on the R-Studio** Drives **panel and click the** R**emove button**, or

Right-click the selected region and select **Remove Region** on the shortcut menu.

To change the size of a region

* **Right-click a Region on the R-Studio** Drives **panel, select Edit on the shortcut menu, and enter a new size on the** Edit Region **dialog box.**

2.2.6 Exclusive Regions

Exclusive regions are areas on any object visible on the the **R-Studio**'s Drives panel that are excluded from disk operations. **R-Studio** never tries to read/write data from/to such area. Exclusive regions are necessary when, for example, there are areas with bad sectors on a hard drive, and it is necessary to avoid any disk operations with such areas to not inflict further damage to such drive and to speed work with it.

Note: R-Studio does not create anything real on the disk. Exclusive regions are virtual objects that do not affect

actual data on the disk.

To create an *exclusive region*

1 **Right-click an object on the R-Studio's** Drives **panel and select Create Exclusive Region on the shortcut menu,** or

Select the object and select **Create Exclusive Region** on the **Create** menu

2 **Specify required parameters on the** Create Exclusive Region **dialog box and click the Add button**

Create exclusive region **dialog box**
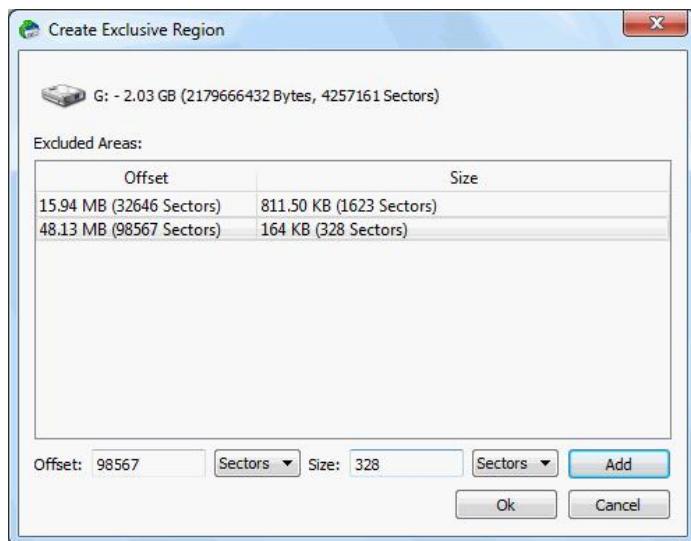
☐ *Exclusive Region options*

Offset:	Start point of the exclusive region
Size:	Size of the exclusive region. Cannot be larger than Disk size.

Numbers in these fields can be in bytes or sectors. If no letters are after the numbers, **R-Studio** assumes the numbers are in bytes.
See **Data Formats** for more details.

> **An Exclusive Region object will appear on the** Drives **panel.**

Its properties can be seen on the Excluded Areas tab.

To remove an exclusive region

* **Select an Exclusive Region on the R-Studio** Drives **panel and click the** R<small>EMOVE</small> **button, or**

Right-click the selected region and select **Remove Region** on the shortcut menu.

To change the size of an exclusive region

* **Right-click an Exclusive Region on the R-Studio** Drives **panel, select Edit on the shortcut menu, and add/remove excluded areas on the Edit**e Exclusive Region **dialog box.**

You may remove an excluded area by right-clicking it and selecting **Remove** on the shortcut menu.

2.2.7 Images

An *image* is an exact, byte by byte, copy of any object on the Drives panel. When created, images can be processed like their original objects.

Images are very useful if there is a risk of total data loss due to hardware malfunction. If bad blocks are constantly appearing on a hard drive, you must immediately create an image of this drive. All data search, scan and restoring can be done from this image.

While creating images, **R-Studio** can simultaneously perform disk scan and save scan information to lessen time necessary to process the disk.

The image can be saved on the remote computer if it is created via network.

To create an *image,*

1 **Select an object on the** R-Studio's Drives **panel and click the Create Image button**

   ⊟ *Other ways to create the image*

   • Select the object and select **Create Image** on the **Drive** menu

   or

   • Right-click the selected object and select **Create Image File** on the shortcut menu

2 **Specify image options, a file name, and destination for the** *image* **on the** Create Image **dialog box**

   Note: To store an image file, you need a free space equal to at least the object size.

Create Image (Main) **dialog box**
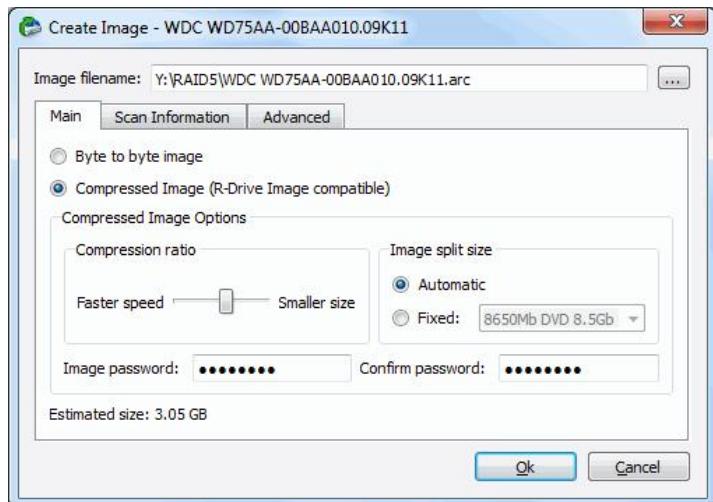
Create Image (Scan Information) **dialog box**
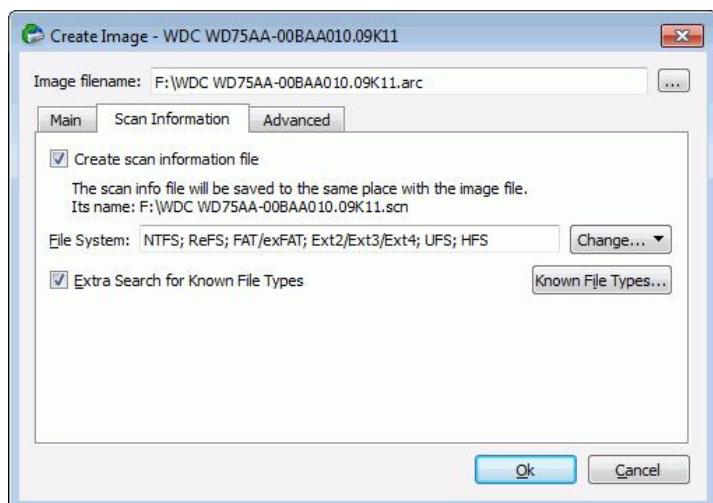
Create Image (Advanced) **dialog box**

▱ *Image Options*

Image name	Specifies the name and path for the image file
Byte to byte image	If this option is selected, **R-Studio** will create a simple exact copy of the object. This image format is compatible with the previous versions of **R-Studio**.
Compressed image (R-Drive Image compatible)	If this option is selected, **R-Studio** will create an image file which can be compressed, split into several parts, and password-protected. This image file is fully compatible with the images created by **R-Drive Image**, but incompatible with the previous versions of **R-Studio**.
Image compression ratio	You may compress the data in the image to save space. Active only if the Compressed image (R-Drive Image compatible) is selected.
Estimated size	Shows the estimated size of the image file. An actual image size depends on how much empty space is on the selected partition and what file types are there. Active only if the Compressed image (R-Drive Image compatible) is selected.
Image split size	You may set this option to Automatic and let Windows decide how to split the image file. This mostly depends on the file system on the destination disk. You may also either explicitly specify the split size, or choose a preset for various devices with removable storage. Select Fixed size for that. Active only if the Compressed image (R-Drive Image compatible) is selected.
Password	You may protect your image file with a password. **Note:** This feature provides a relatively moderate protection against conventional unauthorized access. Active only if the Compressed image (R-Drive Image compatible) is selected.
Create scan information file	If this option is selected, **R-Studio** will perform disk scan simultaneously with image creation. See the **Disk Scan** help page to learn scan options.
Read attempts	Specifies a value for I/O Tries, or how many times **R-Studio** will try to read a bad sector.
Pattern to fill bad blocks	Specifies a pattern **R-Studio** will use to fill bad sectors in this image. You may specify the pattern either in the ANSI or Hex data format. **Note: R-Studio** will never ever try to write anything on the disk from which data is to recover or an image is to create. This pattern fills bad sectors only in the image.

If a remote computer is connected for **Data Recovery over Network**, the Create Image dialog box will have a different look. You may save the image to the local or remote computer.
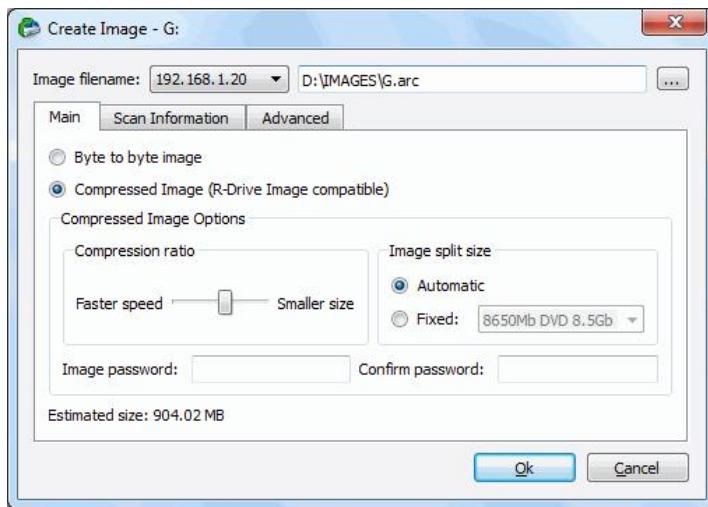
> **R-Studio will start creating the image, the** Progress **message showing the progress.**

To process an already created *Image*, the image file should be opened.

To open an image

1   Click the Open Image button, or

Select **Open Image File** on the **Drive** menu

If a remote computer is connected for **Data Recovery over Network**, the Open Image File dialog box will appear when you select a place to load the image file from. You may load it from the local or remote computer.
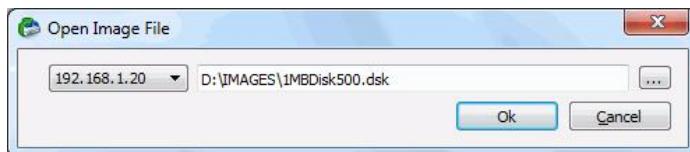
2   Select the required image file

> **An** *Image* **object will appear on the** Drives **panel**

Depending whether this is a byte-by-byte or compressed (**R-Drive Image** compatible), its appearance in the Drives panels is different.

You may perform all data search, scan, and recovery from this image as it were a regular drive/disk object.

Compressed (**R-Drive Image** compatible) images

Byte-to-byte images
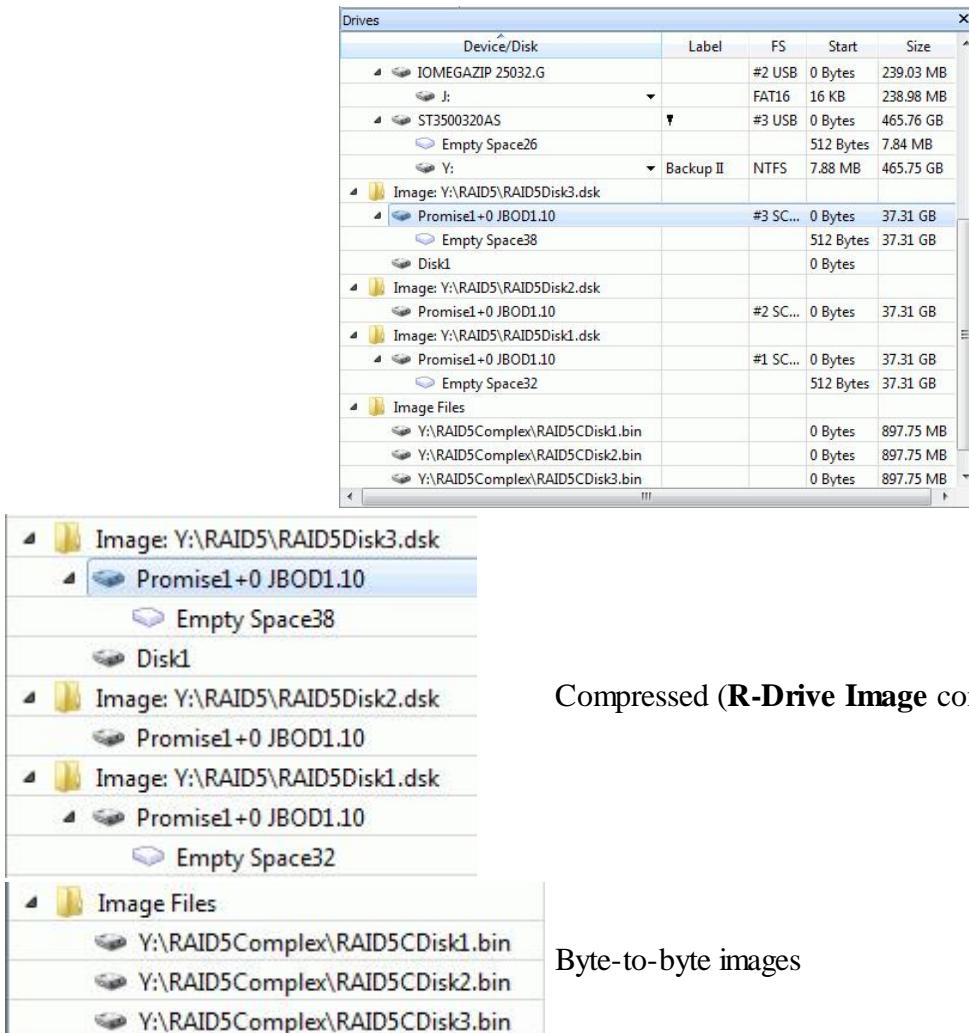
2.2.8 Object Copy

You may copy any object in the Drives panel to any other object, if there is enough space on the target one. Before **Copy object to...** becomes enabled on the **Create** menu, you need to enable writing.

To enable writing,

1 On the **R-Studio** main panel, select the Tools menu, then Settings, and select Enable Write on the Settings dialog box.

\> The Copy object to... will be enabled on the Create menu.
   Now objects can be copied.

Depending on the objects to copy and your tasks, you may do:

Binary (byte to byte copy)
An exact copy of the source object (or a part thereof) to the destination device (from its beginning or a specified offset). Any object may be copied to any object this way.

To perform a binary copy of an object,

1   Select Copy object to... on the Create menu
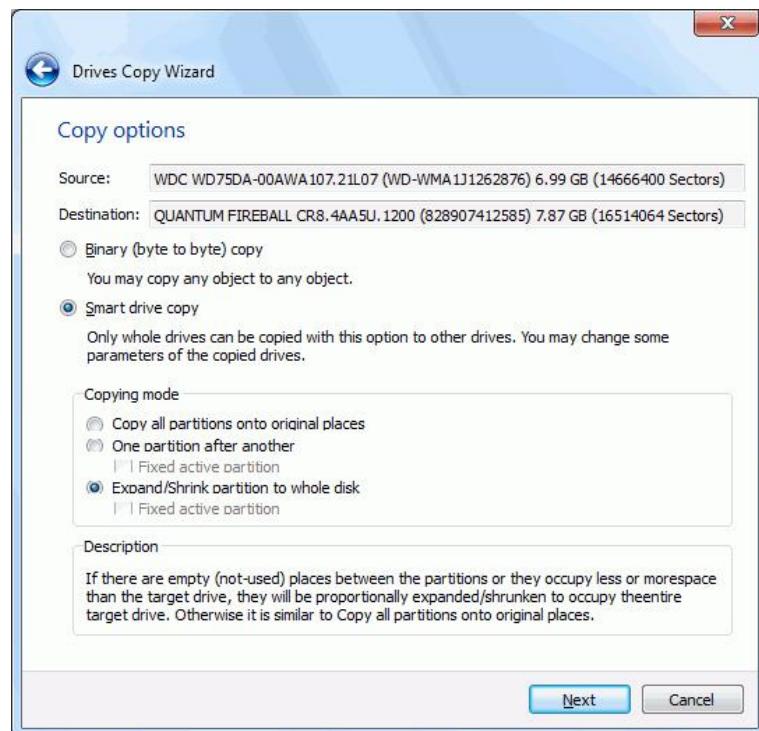
2   Select a source and destination objects on the Drives Copy Wizard **panel and click the Next button**

Drives Copy Wizard
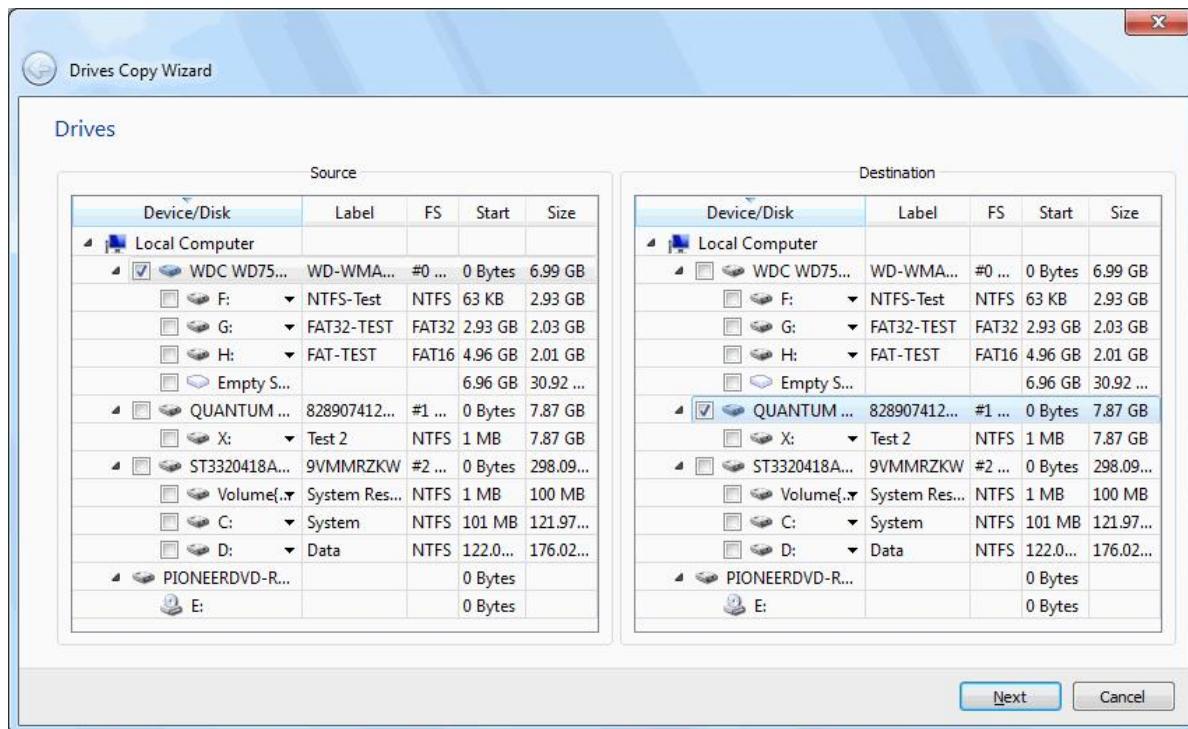
3   Select Binary (byte to byte) copy **on the** Copy Options **dialog box, specify copy options, and click the Next button**

Copy options **dialog box**
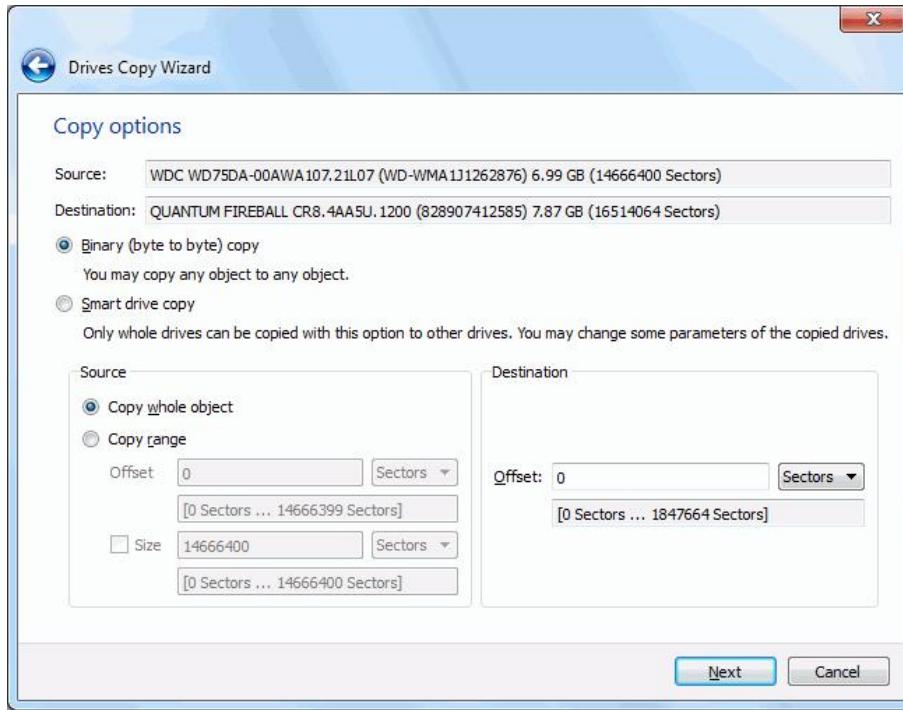
☐ *Copy options*

Source	
Copy whole object	Select this option if you want to copy the entire source object to the destination one
Copy range	Select this option if you want to copy a part of the source object
Offset	Specify the offset from which the source object data will be copied to the destination object
Size	Specify the size of the source object data which will be copied to the destination object
Destination	
Offset	Specify the offset on the destination object to which the source object data will be copied

3 **View the copy task settings on the** Drives Copy Wizard **and click the Finish button**

Drives Copy Wizard
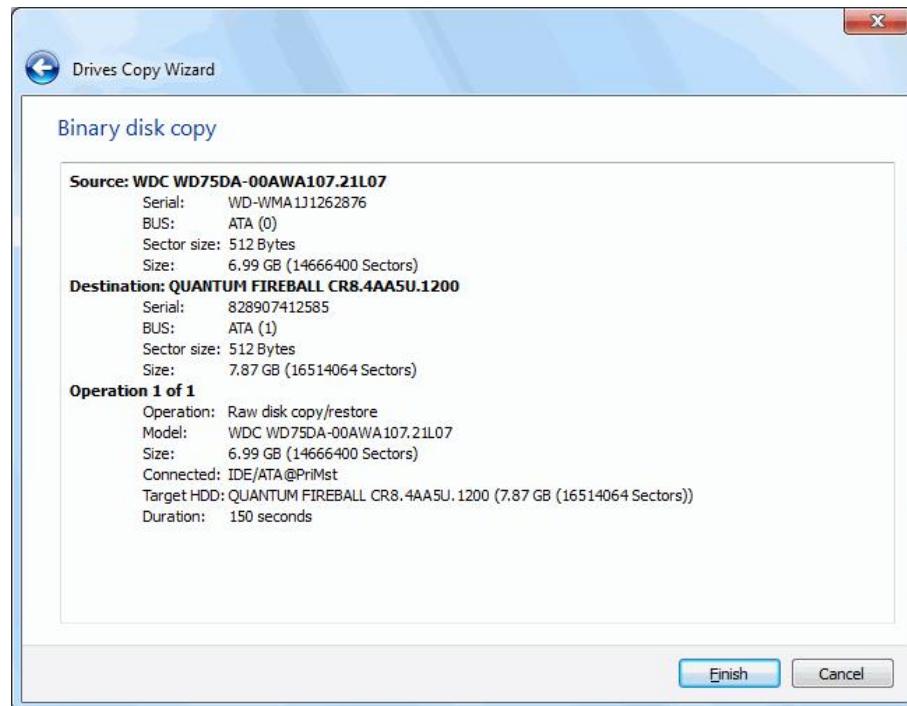
or click the **<Back** button to edit the copy parameters

> **R-Studio** **will start copying data from the source object to the destination one.**

Smart partition copy

Only partitions can be copied with this option to other partitions or empty spaces. You may change some parameters of the the copied partition(s) on the destination drive.

To perform a smart partition copy of a partition,

1 **Select Copy object to... on the Create menu**

2 **Select source and destination partitions on the** Drives Copy Wizard **panel and click the Next button**

Drives Copy Wizard
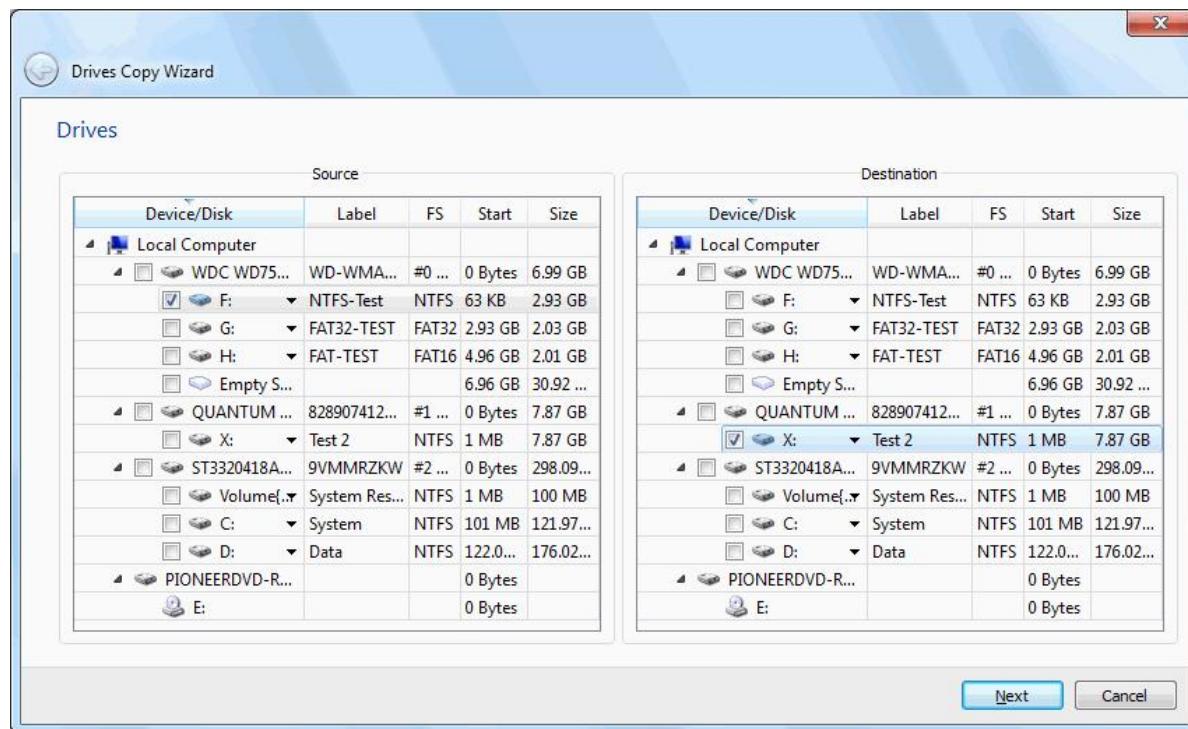
3 **Select** Smart partition copy **on the** Copy Options **panel, specify copy options, and click the Next button**
Copy options **dialog box**
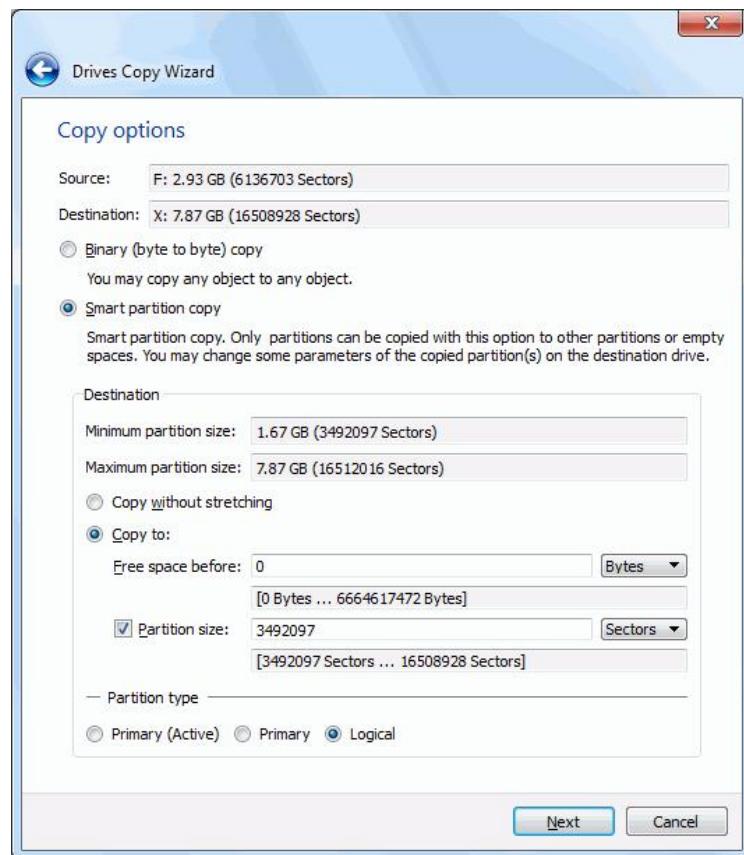
☐ *Copy options*

Destination	
Copy without stretching	Select this option if you want to copy the partition exactly to the destination place
Copy to:	Select this option if you want to change some parameters of the copied partition on the destination place
Free space before	Specify how much space will be left empty before the start of the copied partition
Partition size	Select this option and specify the new size of the copied partition
Partition type Primary (Active)/ Primary/Logical	Specify the type of the partition to be copied. Do not change this setting unless you have serious reasons to do so.

3 **View the copy task settings on the** Drives Copy Wizard **and click the Finish button**

Drives Copy Wizard
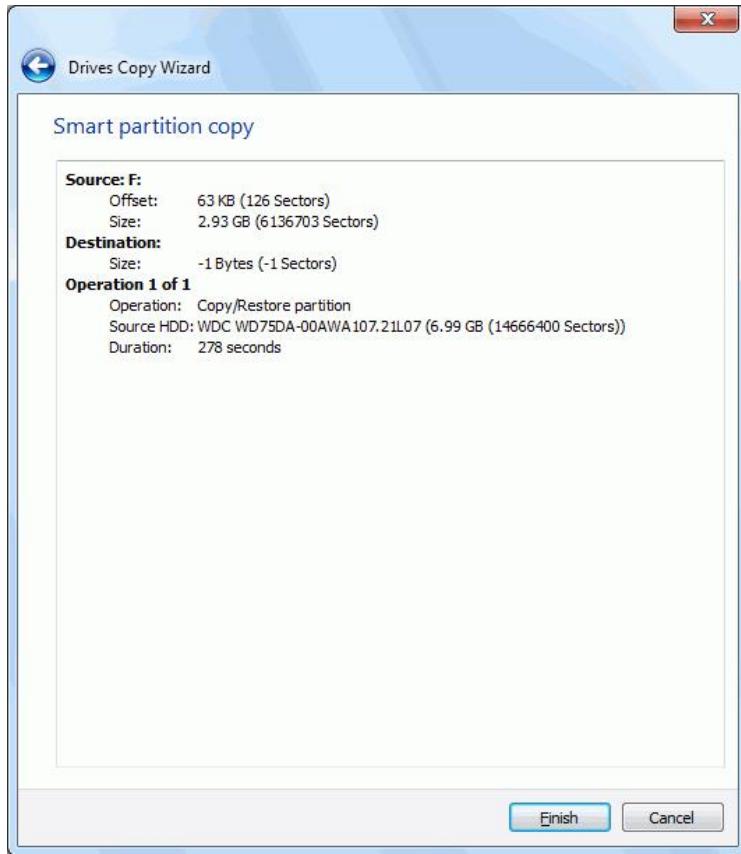
or click the **<Back** button to edit the copy parameters

> **R-Studio will start copying data from the source partition to the destination place.**

Smart drive copy

Only whole drives can be copied with this option to other drives. You may change some parameters of the copied drives.

To perform a smart drive copy of a hard drive,

1 **Select Copy object to... on the Create menu**

2 **Select a source and destination hard drives on the** Drives Copy Wizard **panel and click the Next button**

Drives Copy Wizard
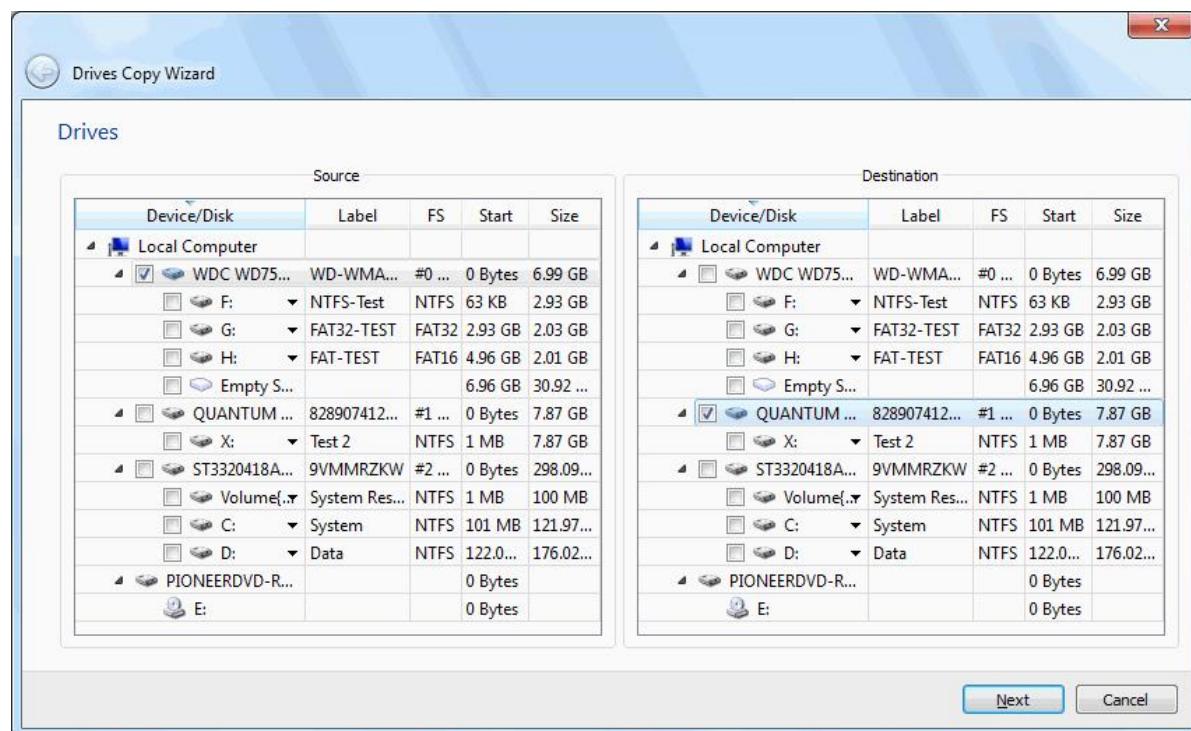
3 **Select** Smart drive copy **on the** Copy Options **panel, specify copy options, and click the Next button**

Copy options **dialog box**

Copy options

Copying mode	
Copy all partitions onto original places	Select this option if you want to copy all partitions to their original places.
One partition after another	Select this option if you want to copy the partitions one after another preserving their space. If there is empty space between the partitions, it will be omitted. Otherwise it is similar to Copy all partitions onto original places. If Fixed active partition is selected, the original offset/size of the active partition will be preserved (in case the loader has links to it).
Expand/Shrink partition to whole disk	Specify this option if you want to proportionally expand/shrink the selected partitions to occupy the entire target drive. If Fixed active partition is selected, the original offset/size of the active partition will be preserved (in case the loader has links to it).

3   View the copy task settings on the Drives Copy Wizard **and click the Finish button**

Drives Copy Wizard
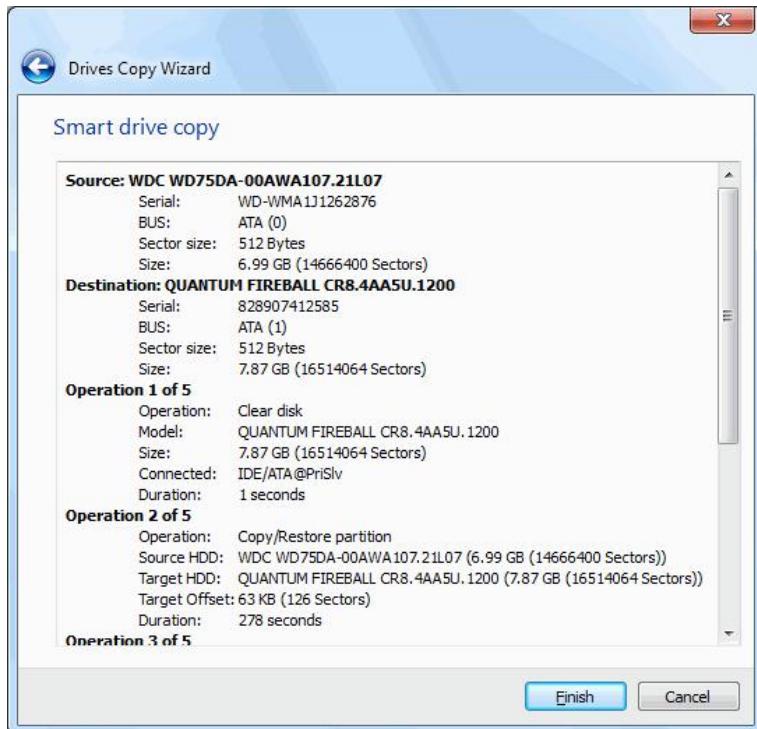
or click the **<Back** button to edit the copy parameters

>   R-Studio will start copying data from the source hard drive to the destination one.

2.3   Mass File Recovery

Recovery of multiple files

If you need to recover multiple files you may do it through the following steps:

1   Find and mark all the necessary files

Go to the Find and Mark Multiple Files topic for more information

2 **Recover all marked files in a single file recovery step**

Go to the Recover Multiple Files topic for more information

3 **Create file recovery lists to manually edit the list of files to recovery**

Go to the File Recovery Lists topic for more information

Memory considerations

R-Studio stores information about found files in computer memory. If there are too many files, **R-Studio** may run out of it. To avoid this, you have two options:

Recover all files

If you want to recover data from an entire file system object (a logical disk, partition, partition image, etc.), you may use the **Recover All Files** command from the **Drive** or shortcut menu. Right click the object in the Drives panel to access the shortcut menu. A Recover dialog box will appear. Select required restore settings, including file mask. This command restores unlimited number of files without memory restrictions.

View file information in steps

As soon as **R-Studio** nearly runs out of memory, a Too many files... message appears. You may temporaly stop file listing and browse through found files. Then you can resume file listing. You also may skip this file section and continue file listing.

In all cases, **R-Studio** keeps information about the entire file structure.

- **Find and Mark Multiple Files**
- **Recover Multiple Files**

2.3.1   Find and Mark Multiple Files

If you need to find and mark many files at once, you may do that in the following ways:

By sorting them by their extensions or creation/modification/accessed time

To sort files by their extensions or creation/modification/accessed time,

*   **On the** Folders **panel select the tab**

Extensions   to sort the files by their extensions

Creation   to sort the files by their creation time
Time

Modificationto sort the files by their modification time
Time

Accessed   to sort the files by their accessed time
Time

   ⊟ *Other ways to sort files by their extensions or creation/modification/accessed time*

 - Select the disk on Drives panel, select **Open Drive Files Sorted By** on the **Drive** menu, and select the respective option,

   or

 - On the Drives panel, right-click the disk and select **Open Drive Files Sorted By** on the shortcut menu and select the respective option,

   or

 - On the Folders panel, right-click the disk letter and select **Show Files Sorted By** on the shortcut menu and select the respective option,

> **R-Studio will show the sorted files in the** Folders **and** Content **panels, showing the path to each file:**

Folders panel for files sorted by their extensions
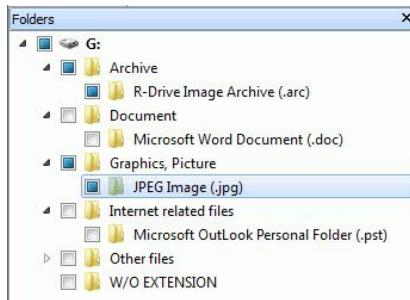
Content panel with files/folders sorted by their extensions

To return to the conventional view,

* **On the** Drives **panel, right-click the logical disk, select Open Drive Files Sorted By on the shortcut menu, and select Real File System Structure,**

    or

    On the Folders panel, select **Show Files Sorted By** on the **Drive** menu and select **Real File System Structure**

    or

    Click the **Real** tab

By finding and marking multiple files using the [Find/Mark](#) *dialog box*

You may find and mark all the files on the entire disk by using Mark matched files in the Find/Mark mode option. You may specify all the necessary search options and mark all the found files. Please note that each find and mark/unmark operation is independent from previous ones. That is, if a file matches the search criteria, it will be marked/unmarked regardless of its previous marked/unmarked state.

For example, if you first mark all doc files, and then all txt files, all doc files remain marked, too. If you then decide to unmark all files smaller than 2 kB, all doc and txt files will stay marked except those that less than 2 kB.

2.3.2   Recover Multiple Files

If **R-Studio** while recovering files encounters either an already existing file or file with a broken name, normally it will stop working and ask you what to do with the file. If you recover multiple files, that may require you answer a lot of the same questions. You may use Mass File Recovery Options on the [Recover](#) dialog box to instruct **R-Studio** what to do in those cases for all files.

Recover (Advanced) **dialog box**
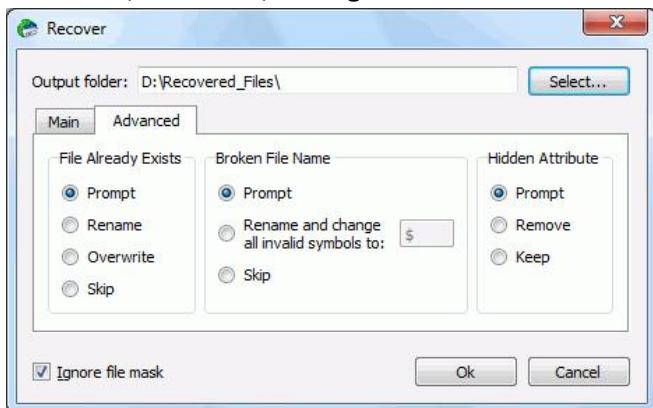
⊟Advanced file recovery options

File Already Exists	These options instruct **R-Studio** what to do if there already exists a file with the same name.
Prompt	If this option is selected, **R-Studio** asks the user what to do for each such file. It stops file recovery until it receives the answer.
Rename	If this option is selected, **R-Studio** adds a File ID to the file name. If a file already exists with the same name and that file ID, a number will be added to th file name and file ID.
Overwrite	If this option is selected, **R-Studio** overwrites the old file with the new one.
Skip	If this option is selected, **R-Studio** skips all new files with the same name.
Broken File Name	These options instruct **R-Studio** what to do if a file to be recovered appears to have an invalid name.
Prompt	If this option is selected, **R-Studio** shows the standard Broken File Name dialog box for each file with a broken file name. It stops file recovery until it receives the answer.
Rename and change all invalid symbols to:	If this option is selected, **R-Studio** changes all invalid characters to the character specified.
Skip	If this option is selected, **R-Studio** skips all files with broken file names.
Hidden Attribute	These options instruct **R-Studio** what to do if a file to be recovered appears to have the Hidden attribute.
Prompt	If this option is selected, **R-Studio** asks the user what to do with the attribute. It stops file recovery until it receives the answer.
Remove	If this option is selected, **R-Studio** removes the Hidden attribute from all files.
Keep	If this option is selected, **R-Studio** keeps the Hidden attribute for all files.

2.3.3   File Recovery Lists

You may create a file containing a list of files and folder found on a disk/partition. Then such file may be manually edited to specify files to recover and then loaded back into **R-Studio**. **R-Studio** will automatically mark the files in this list for recovery. Such file lists recovery are very useful, for example, when it is necessary to have such file lists approved for recovery by someone else who is far away from the computer where **R-Studio** is running.

You may create file recovery lists for the entire disk or for specific folders. Moreover, you may create a file recovery list for all files within the disk/folder, or for marked files/folders only.

Creating a file recovery list

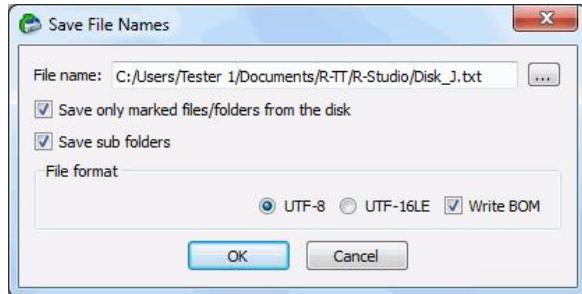#### To create a file recovery list

1   **For an entire disk, select Save File Names to File on the File menu, or**

Right-click the uppermost folder (higher than **Root**, usually the letter or the name of the disk) and select **Save File Names to File** on the shortcut menu.

For a specific folder, right-click the folder and select Save File Names to File on the shortcut menu.

2   **Specify the place to save the file recovery list and other necessary options on the** Save File Names **dialog box**

Save File Names **dialog box**

◻*Save File Names options*

File name:	Specifies file name of the file recovery list.
Save only marked files/ folders from...	If this option is selected, only marked files will be included into the file recovery list.
Save sub folders	If this option is selected, sub folders and their files will also be included into the file recovery list.
File format:	Specifies the file format in which localized file/folder names will be saved, You may select either the UTF-8 or UTF-16 codepage. Also you may write a special BOM header to the file which helps some text editors to understand which codepage is used.

Structure of a file recovery list file created by R-Studio

An example of such a file:

```
:# PathDelim = \
Files to Delete\
Files to Delete\File_2.pst
Files to Delete\Outlook_recovered_by_R_Mail.pst
Files to Recover\
Files to Recover\$est2.arc
Files to Recover\$est4.arc
Files to Recover\$est5.arc
Files to Recover\$est6.arc
Files to Recover\$est7.arc
Files to Recover\~$pe Test 2.doc
Files to Recover\Outlook.pst
```

```
Files to Recover\Outlook_recovered_by_R_Mail.pst
Files to Recover\Picture 113.jpg
Files to Recover\Picture 149.jpg
Files to Recover\Picture 237.jpg
Files to Recover\test1.arc
Files to Recover\test3.arc
Files to Recover\Wipe Test 1.doc
Files to Recover\Wipe Test 2.doc
Files to Recover\Wipe Test 3.doc
Files to Recover\Wipe Test 4.doc
Files to Recover\Wipe Test 5.doc
Files to Recover\Wipe Test 6.doc
```

`:# PathDelim = \` is a parameter specifying a character for path delimitation. You may also specify a Unix-stile delimiter `/` .

`:# PathDelim = \`

`:# PathDelim = /`

In addition, the files from the virtual folders `Metafiles`, `ExtraFoundFiles`, etc..., have the following designations:

Metafiles:	`///m/[localized_name_for_Metafiles]/`
Extra Found Files:	`///e/[localized_name_for_ExtraFoundFiles]/`
Other Virtual Folders:	`///v/[localized_name_for_OtherVirtualFolders]/`

For the English language, that will look like:

```
///m/Metafiles\
///m/Metafiles\$BOOT
///m/Metafiles\$FAT
///m/Metafiles\$FAT0
///m/Metafiles\$FAT1
```

Editing the file recovery list file

All files included into a file recovery list will be marked when the file will be loaded into **R-Studio**. So, if you have some files in the file recovery list that doesn't need to be recovered, just delete them from the list. In addition, you may use the following marks to specify some options

`:+`	Mark all files and subfolders within the folder.
`:*`	Mark only files within the folder.
`:-`	Unmark the file or all files and subfolders within the folder.
`:=`	Unmark the file or only files within the folder.

processes records in the file consequently. That is, if there are the following lines in the file,

```
:+Files to Delete\
:-Files to Delete\File_2.pst
```

the file `File_2.pst` won't be marked for recovery, while for the lines

```
:-Files to Delete\File_2.pst
:+Files to Delete\
```

file `File_2.pst` will be.

Please note that records for folders without any marks don't affect the file marking. Thus, for the lines

```
:-Files to Delete\File_2.pst
 Files to Delete\
```
file `File_2.pst` will not be marked.

Loading the file recovery list

To load a file recovery list into R-Studio,

* **Select Load File Names from File and Mark on the File menu and select the file.**

> **R-Studio will load the file and mark the files accordingly.**

2.4 Volume Sets and RAIDs

R-Studio detects and processes valid hardware volume sets and RAIDs like regular drives/volumes.

R-Studio can analyze and recover data from software volume sets and RAIDs. If a software volume set or RAID is present in your system, **R-Studio** detects it, and a *Volume sets and RAIDs* object appears on the `Drives` panel. This object can be searched for files, scanned, and files found on it can be recovered the same way as from normal drives/volumes.

If, due to hardware failure, a hardware volume set or RAID cannot be accessed, or due to data loss your system does not recognize a software volume set or RAID, and you know what hard drives were in it, you may create a *Virtual volume set* or *RAID* and process it like a real software volume set or RAID or hardware volume set or RAID.

You may find more information on RAID data structure in Wikipedia.

You may turn numerical indexes for objects to distinguish them better while creating virtual RAIDs.

- **Volume Sets, Stripe Sets, and Mirrors**
- **Basic RAID 4 and RAID 5 Operations**
- **Working with RAID 6 Presets**
- **Working with RAID6 (Double Xor)**
- **Working with RAIDs with Parity Delays**
- **Working with Advanced RAID Layouts**
- **Nested and Non-Standard RAID Levels**
- **Finding RAID Parameters**
- **Checking RAID Consistency**
- **Syntax of a Description File for RAID Configurations**
- **Description Files for RAID Configurations**

Managing your own RAID layouts

To save your own RAID layout in the presets

1 **Click the More... button on** `Parents` **tab and select Save on the shortcut menu.**

2 **Specify the name for the configuration on the** `Preset name` **dialog box.**

Preset name **dialog box**

> **The new RAID configuration will be saved in the presets**

The configurations are stored in the <u>user's RAID layout file</u>. The path and name for this file is specified on the <u>R-Studio Settings</u> dialog box. If no file is specified, **R-Studio** will ask you to enter the name.

To load your RAID configuration

1 **Click the More... button on** Parents **tab and select the preset you want to load**

> **The new RAID configuration will be loaded**

To edit your own RAID configuration

1 **Click the More... button on** Parents **tab and select Edit... on the shortcut menu**

2 **Select the required configuration on the** Edit Block RAID Layout Presets **dialog box.**

Edit Block RAID Layout Presets **dialog box**
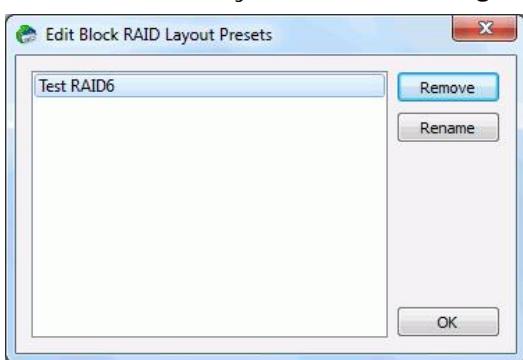
3 **Edit the parameters of the configuration and save it**

> **The new configuration parameters will be saved.**

Turning Disks On-Line and Off-Line on-the-fly

You may turn the objects in the virtual RAID or volume set on-line and off-line by selecting/clearing the checkbox on the Parents tab. It may be useful, for example, if you need to see which disk is non-actual in a RAID 5.

Actually, when you turn an object off-line, **R-Studio** substitutes it with a ***Missing Disk*** or ***Empty Space*** object.

Missing Disks and Empty Space

If one partition from a hardware volume set or RAID or software volume set or RAID is absent, due to hardware failure, for example, you need to add a virtual missing disk or empty space in order to correctly reconstruct the hardware volume set or RAID or software volume set or RAID structure. The missing disk/empty space should be placed in the same place as the missing partition.

Note: R-Studio does not write anything real on the disk. Missing disks/empty space are virtual objects that do not affect actual data on the drive.

To add a *Missing disk/Empty space* object

1 **Select a** *Volume sets and RAIDs* **object on the R-Studio's Drives panel**

2 **Right-click in the** Parents **tab in the right pane and select Add Missing Disk or Add Empty Space on the shortcut menu or select Add Missing Disk or Add Empty Space on the Create menu. Which object type is necessary,** **R-Studio** **decides automatically.**

For the **Empty space** object, Specify its size on the Add Empty Space dialog box.

Add Empty Space **dialog box**

> **> A *Missing Disk* or Empty Space object will appear in the** Parents **tab**

2.4.1   Volume Sets, Stripe Sets, and Mirrors

To create a Volume set object

1   Click the Create Virtual RAID button and select Create Virtual Volume set
  or select the **Create Virtual Volume set** on the **Create** menu

> **> A Virtual Volume set object will appear on the** Drives **panel**

2   Drag the required partitions from the Drives **panel to the** Parents **tab**

  ⊟ *Other ways to add objects*
  • Right-click the Parents tab and select the required partition from the shortcut menu,
  or
  • Right-click the partition on the Drives panel, select **Add to RAID** on the shortcut menu, and select the
    RAID object you want to add the partition to.
  Note: Objects should be placed in the same order as they were in the original volume set. If this order is
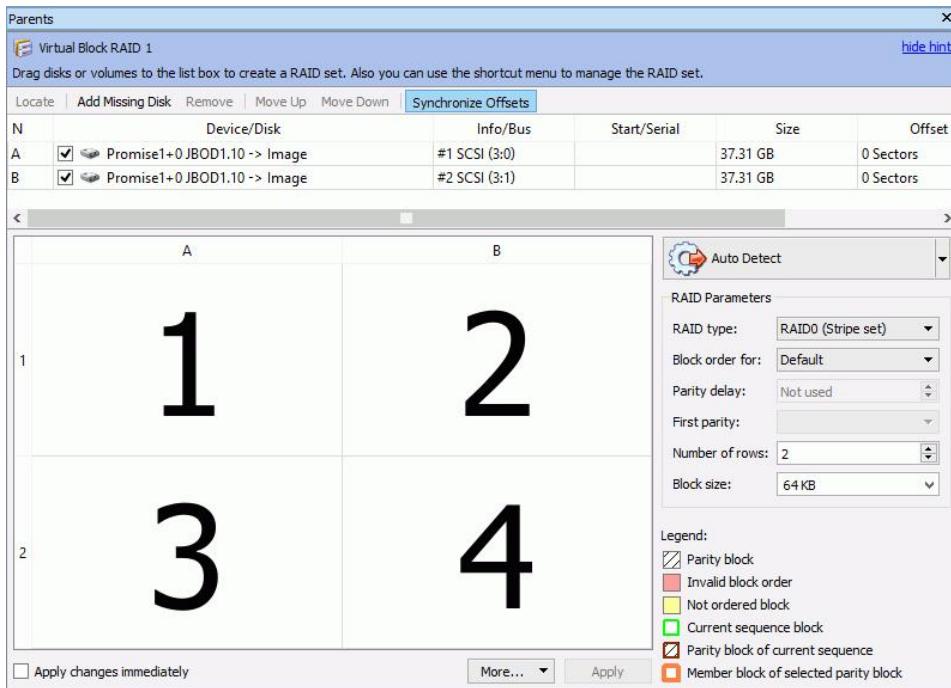 incorrect, you must change it by dragging the parents to place them in the correct order.

> **> The *Virtual volume set or RAIDs* object can now be processed like regular drives/volumes**
  If **R-Studio** detects a valid file system on the newly created RAID object, a partition object will appear on
  the Drives panel.

To create a Stripe set object (RAID 0)

1   Click the Create Virtual RAID button and select Create Virtual Block RAID & Autodetect
   or select the **Create Virtual Block RAID & Autodetect** on the **Create** menu

>   A Virtual Block RAID object will appear on the Drives **panel**

2   Select RAID 0 (Stripe set) on the RAID type

3   Drag the required partitions from the Drives **panel to the** Parents **tab**

   ☐ *Other ways to add objects*
   • Right-click the Parents tab and select the required partition from the shortcut menu,
   or
   • Right-click the partition on the Drives panel, select **Add to RAID** on the shortcut menu, and select the
     RAID object you want to add the partition to.
   You may either make **R-Studio** to process your changes immediately or wait until you finish editing the
   RAID layout. Select or clear the Apply changes immediately checkbox on the Parents tab. Click the **Apply**
   button to apply the changes when are you through.
   Note: Objects should be placed in the same order as they were in the original volume set. If this order is
   incorrect, you must change it by dragging the parents to place them in the correct order.

   ☐ *Object control buttons*

Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Disk	Click this button to add an empty space or missing disk object to the RAID
Remove	Click this button to remove the selected object from the RAID

Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID

The Block size and Offset (in sectors) parameters must be set the same as for the original volume set.

You also need to specify Block order. You may select it on the Blocks order drop-down or shortcut menu.

If the those parameters are not correct, data on the parents will not be damaged, but they cannot be recovered.

> **The Virtual Block RAID object can now be processed like regular drives/volumes**

If **R-Studio** detects a valid file system on the newly created RAID object, a partition object will appear on the Drives panel.

The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.

You also may check the RAID consistency, if necessary. See the **Checking RAID Consistency** help page for details.

To create a Mirror set object (RAID 1)

1 **Click the Create Virtual RAID button and select Create Virtual Mirror**

or select the **Create Virtual Mirror** on the **Create** menu

> **A Virtual Mirror object will appear on the** Drives **panel**

2 **Drag the required partitions from the** Drives **panel to the** Parents **tab**

⊟ *Other ways to add objects*

• Right-click the Parents tab and select the required partition from the shortcut menu,

or

• Right-click the partition on the Drives panel, select **Add to RAID** on the shortcut menu, and select the RAID object you want to add the partition to.

> **The Virtual Mirror object can now be processed like regular drives/volumes**

If **R-Studio** detects a valid file system on the newly created RAID object, a partition object will appear on the Drives panel.

2.4.2   Basic RAID 4 and RAID 5 Operations

RAID 4 and RAID 5 are much similar. You may create and edit a RAID 4 object the same way as a RAID 5 one.

To create a RAID 5 object

1   Click the Create Virtual RAID button and select Create Virtual Block RAID & Autodetect
    or select the **Create Virtual Block RAID & Autodetect** on the **Create** menu

>   A Virtual Block RAID object will appear on the Drives **panel**

2   Select RAID 5 on the RAID type

3   Drag the required partitions from the Drives **panel to the** Parents **tab**

  ☐ *Other ways to add objects*

  • Right-click the Parents tab and select the required partition from the shortcut menu,
  or
  • Right-click the partition on the Drives panel, select **Add to RAID** on the shortcut menu, and select the
    RAID object you want to add the partition to.
  You may either make **R-Studio** to process your changes immediately or wait until you finish editing the
  RAID layout. Select or clear the Apply changes immediately checkbox on the Parents tab. Click the **Apply**

button to apply the changes when are you through.

Note: Objects should be placed in the same order as they were in the original RAID 5. If this order is incorrect, you must change it by dragging the parents to place them in the correct order.

■ *Object control buttons*

Locate	Click this button to locate the selected object in the `Drives` panel.
Add Empty Space/Add Missing Disk	Click this button to add an empty space or missing disk object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID

The `RAID block size` and `Offset` (in sectors) parameters must be set the same as for the original RAID 5.

You also need to specify `Block order` for virtual RAID 5. You may select it on the `Block order` drop-down or shortcut menu.
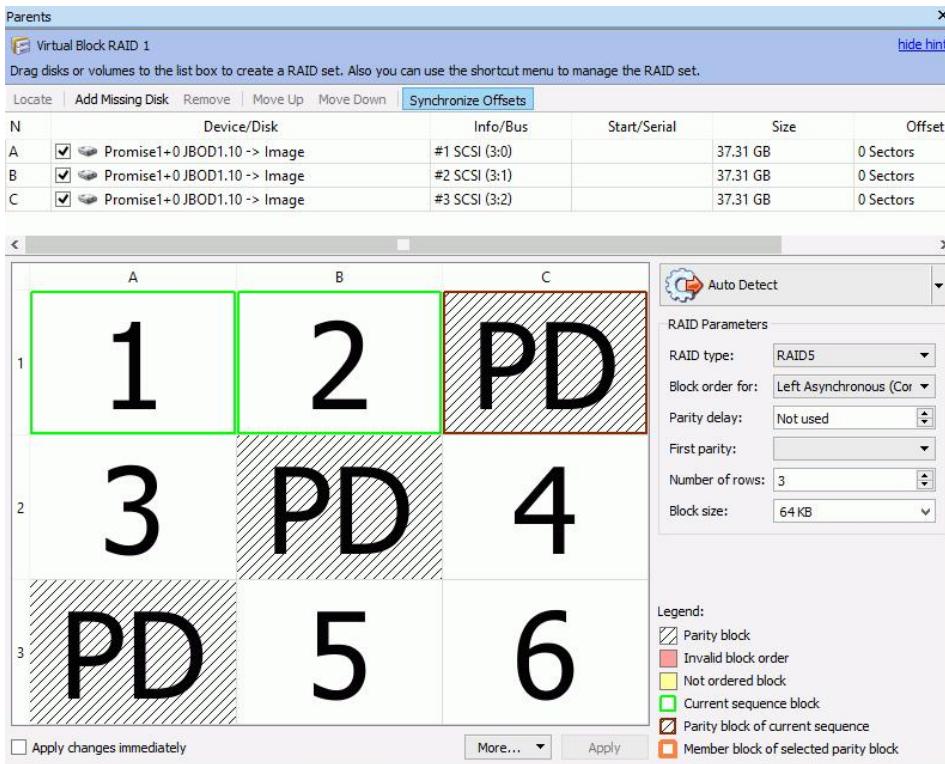
If the those parameters are not correct, data on the parents will not be damaged, but files from the RAID 5 cannot be recovered.

Note: You may check how correctly you have reconstructed the original RAID 5. Find a file and preview it. If the file appears correct, you have created a correct RAID 5 layout.

If your RAID 5 has an unusual configuration, you may create them manually. See **Working with Advanced RAID Layouts** for details.

Parents **tab**

> **The** *RAID 5* **object can now be processed like regular drives/volumes**

If **R-Studio** detects a valid file system on the newly created RAID object, a partition object will appear on the Drives panel.

The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.

You also may check the RAID consistency, if necessary. See the **Checking RAID Consistency** help page for details.

Creating and saving your own RAID 5 configuration

You may create and save your own RAID configurations for non-standard RAIDs. You may specify Offset, Block order/size and Row count. See **Working with Advanced RAID 5 Layouts** for details.

2.4.3   Working with RAID 6 Presets

R-Studio allows you to create and process RAID 6 layouts. You may use either presets for several RAID 6 layouts, or use your own custom ones.

R-Studio provides presets for the following RAID 6 layouts:

Reed-Solomon

Left Synchronous (standard),	Left Asynchronous (continuous),	Right Synchronous	Right Asynchronous

Creating a RAID 6 object from a preset:

We will use the Reed-Solomon (Left Synchronous (standard)) preset as an example.

To create a RAID 6 object

1   Click the Create Virtual RAID button and select Create Virtual Block RAID & Autodetect
or select the **Create Virtual Block RAID & Autodetect** on the **Create** menu

>   A Virtual Block RAID object will appear on the Drives **panel**

2   Select RAID 6/Reed-Solomon on the RAID type

3   Drag the required partitions from the Drives **panel to the** Parents **tab**

   Other ways to add objects

   • Right-click the Parents tab and select the required partition from the shortcut menu,
   or
   • Right-click the partition on the Drives panel, select **Add to RAID** on the shortcut menu, and select the
      RAID object you want to add the partition to.

You may either make **R-Studio** to process your changes immediately or wait until you finish editing the
RAID layout. Select or clear the Apply changes immediately checkbox on the Parents tab. Click the **Apply**
button to apply the changes when are you through.

Parents **tab**

Note: Objects should be placed in the same order as they were in the original volume set. If this order is incorrect, you must change it by dragging the parents to place them in the correct order.

▣ *Object control buttons*

Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Disk	Click this button to add an empty space or missing disk object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID

The RAID block size and Offset (in sectors) parameters must be set the same as for the original volume set.

You also need to specify Blocks order (Left Synchronous (standard) for our case) for virtual RAID 6. You may select it on the Blocks order drop-down or shortcut menu.

If the those parameters are not correct, data on the parents will not be damaged, but they cannot be recovered.

Note: You may check how correctly you have reconstructed the original volume set or RAID. Find a file and preview it. If the file appears correct, you have created a correct RAID layout.

> **The Virtual Block RAID object can now be processed like regular drives/volumes**

If **R-Studio** detects a valid file system on the newly created RAID object, a partition object will appear on

the `Drives` panel. The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.

Device/Disk	Label	FS	Start	Size
▲ 🖥 Local Computer				
▷ 💿 WDC WD75DA-00AWA107....	WD-WMA1J126...	#0 AT...	0 Bytes	6.99 GB
▷ 💿 ST3320418ASCC44	9VMMRZKW	#1 SA...	0 Bytes	298.09 GB
▷ 💿 PIONEERDVD-RW DVR-219...			0 Bytes	
▷ 💿 IOMEGAZIP 25032.G		#2 USB	0 Bytes	239.03 MB
▲ 💿 ST3500320AS	▾	#3 USB	0 Bytes	465.76 GB
💿 Empty Space26			512 Bytes	7.84 MB
💿 Y: ▾	Backup II	NTFS	7.88 MB	465.75 GB
▲ Virtual Volume sets and RAIDs				
▲ 📦 **Virtual Block RAID 1**		**NTFS**	**0 Bytes**	**2.63 GB**
💿 Direct Volume		NTFS	0 Bytes	2.63 GB
▲ 📁 Image Files				
💿 Y:\RAID6RS\img1.bin			0 Bytes	897.75 MB
💿 Y:\RAID6RS\img2.bin		NTFS	0 Bytes	897.75 MB
💿 Y:\RAID6RS\img3.bin			0 Bytes	897.75 MB
💿 Y:\RAID6RS\img4.bin			0 Bytes	897.75 MB
💿 Y:\RAID6RS\img5.bin			0 Bytes	897.75 MB

You also may check the RAID consistency, if necessary. See the **Checking RAID Consistency** help page for details.

2.4.4 Working with RAID6 (Double Xor) Presets

R-Studio allows you to create and process RAID 6 Double Xor layouts with the following presets:

EVENODD RAID DP X-Code(2) Adaptec 3805

In addition you may create your own RAID 6 configurations.

Creating a RAID 6 (Double Xor) object from a preset:

We will use the EVENODD preset as an example.

To create a RAID 6 (Double Xor) object

1 Click the **Create Virtual RAID** button and select **Create Virtual Block RAID & Autodetect** or select the **Create Virtual Block RAID & Autodetect** on the **Create** menu

> **A Virtual Block RAID object will appear on the** Drives **panel**

Device/Disk	Label	FS	Start	Size
▲ 🖥 Local Computer				
▲ 💿 ST3320418ASCC44	9VMMRZKW	#0 SATA...	0 Bytes	298.09 GB
💿 Volume{445abf3b-13ef-11e0-b147..▾	System Reserved	NTFS	1 MB	100 MB
💿 C: ▾	System	NTFS	101 MB	121.97 GB
💿 D: ▾	Data	NTFS	122.07 GB	176.02 GB
▲ 💿 PIONEERDVD-RW DVR-219L1.00			0 Bytes	
💿 E:			0 Bytes	
▲ 💿 ST3500320AS	222291759477	#1 USB	0 Bytes	465.76 GB
💿 Empty Space14			512 Bytes	7.84 MB
💿 Y: ▾	Backup II	NTFS	7.88 MB	465.75 GB
▲ Virtual Volume sets and RAIDs				
📦 Virtual Block RAID 1			0 Bytes	
▲ 📁 Image Files				
💿 Y:\RAID62X\RAID62X1.bin		NTFS	0 Bytes	897.75 MB
💿 Y:\RAID62X\RAID62X2.bin			0 Bytes	897.75 MB
💿 Y:\RAID62X\RAID62X3.bin			0 Bytes	897.75 MB
💿 Y:\RAID62X\RAID62X4.bin			0 Bytes	897.75 MB
💿 Y:\RAID62X\RAID62X5.bin			0 Bytes	897.75 MB
💿 Y:\RAID62X\RAID62X6.bin			0 Bytes	897.75 MB

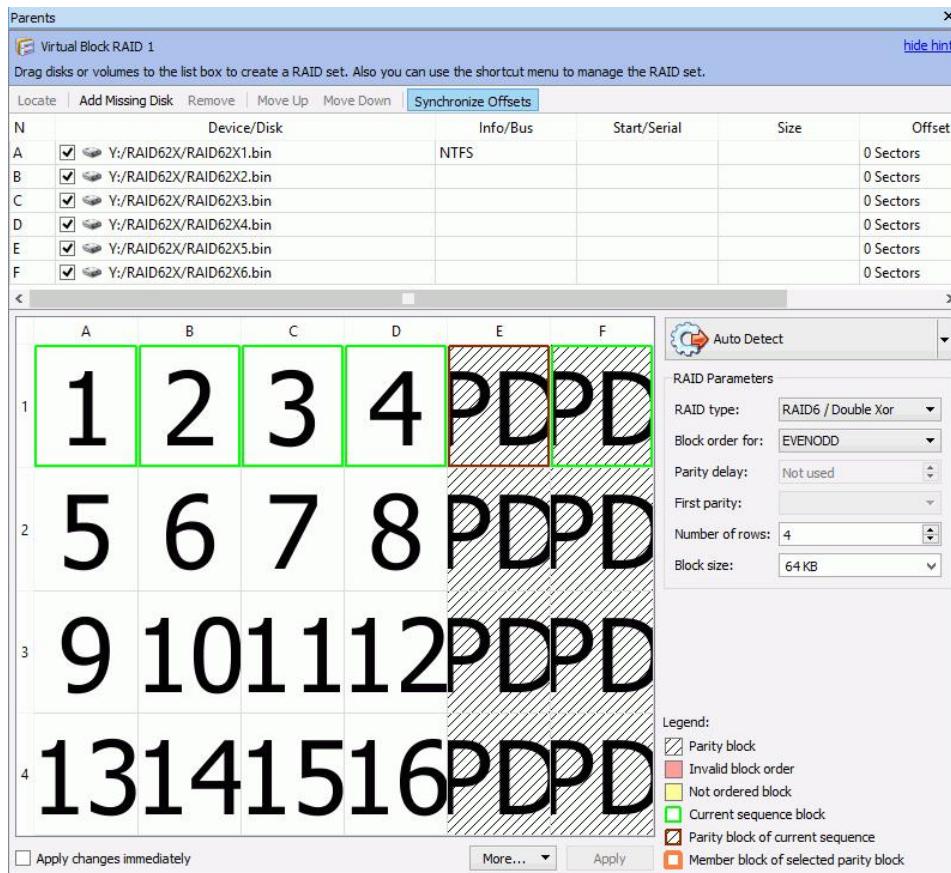**2** Select **RAID 6 / Double Xor on the RAID type**

3 **Drag the required partitions from the** Drives **panel to the** Parents **tab**

  ⊟ *Other ways to add objects*
  - Right-click the Parents tab and select the required partition from the shortcut menu,
  or
  - Right-click the partition on the Drives panel, select **Add to RAID** on the shortcut menu, and select the RAID object you want to add the partition to.

You may either make **R-Studio** to process your changes immediately or wait until you finish editing the RAID layout. Select or clear the Apply changes immediately checkbox on the Parents tab. Click the **Apply** button to apply the changes when are you through.

Parents **tab**

Note: Objects should be placed in the same order as they were in the original volume set. If this order is incorrect, you must change it by dragging the parents to place them in the correct order.

  ⊟ *Object control buttons*

Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Disk	Click this button to add an empty space or missing disk object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID

Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID

The RAID block size and Offset (in sectors) parameters must be set the same as for the original volume set.

You also need to specify Blocks order (EVENODD for our case) for virtual RAID 6 (Double Xor). You may select it on the Blocks order drop-down or shortcut menu.

If the those parameters are not correct, data on the parents will not be damaged, but they cannot be recovered.

Note: You may check how correctly you have reconstructed the original volume set or RAID. Find a file and preview it. If the file appears correct, you have created a correct RAID layout.

>   The Virtual Block RAID object can now be processed like regular drives/volumes

If **R-Studio** detects a valid file system on the newly created RAID object, a partition object will appear on the Drives panel. The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.

Drives				×
Device/Disk	Label	FS	Start	Size
▲ 🖳 Local Computer				
▲ 💾 ST3320418ASCC44	9VMMRZKW	#0 SATA...	0 Bytes	298.09 GB
💾 Volume{445abf3b-13ef-11e0-b147.▾	System Reserved	NTFS	1 MB	100 MB
💾 C: ▾	System	NTFS	101 MB	121.97 GB
💾 D: ▾	Data	NTFS	122.07 GB	176.02 GB
▲ 💿 PIONEERDVD-RW DVR-219L1.00			0 Bytes	
💿 E:			0 Bytes	
▲ 💾 ST3500320AS	222291759477	#1 USB	0 Bytes	465.76 GB
◯ Empty Space14			512 Bytes	7.84 MB
💾 Y: ▾	Backup II	NTFS	7.88 MB	465.75 GB
▲ Virtual Volume sets and RAIDs				
▲ 📦 Virtual Block RAID 1		NTFS	0 Bytes	3.51 GB
💾 Direct Volume		NTFS	0 Bytes	3.51 GB
▲ 📁 Image Files				
💾 Y:\RAID62X\RAID62X1.bin		NTFS	0 Bytes	897.75 MB
💾 Y:\RAID62X\RAID62X2.bin			0 Bytes	897.75 MB
💾 Y:\RAID62X\RAID62X3.bin			0 Bytes	897.75 MB
💾 Y:\RAID62X\RAID62X4.bin			0 Bytes	897.75 MB
💾 Y:\RAID62X\RAID62X5.bin			0 Bytes	897.75 MB
💾 Y:\RAID62X\RAID62X6.bin			0 Bytes	897.75 MB

You also may check the RAID consistency, if necessary. See the **Checking RAID Consistency** help page for details.

2.4.5   Working with RAIDs with Parity Delays

R-Studio allows you to create RAIDs with parity delays (any level that allows that). For example, let us create a RAID 5 the parity delays with the following layout:

- Three disks,
- Delay=16
- Block size: 16 KB
- Offset: 1088 sectors (544 KB)
- Block order: Left Asynchronous (Continuous)
- ▣ *Block order table:*

	A	B	C	
1	1	2	PD	
2	3	4	PD	Delay=16
3	5	6	PD	

4	7	8	PD	
5	9	10	PD	
6	11	12	PD	
7	13	14	PD	
8	15	16	PD	
9	17	18	PD	
10	19	20	PD	
11	21	22	PD	
12	23	24	PD	
13	25	26	PD	
14	27	28	PD	
15	29	30	PD	
16	31	32	PD	
17	33	PD	34	
18	35	PD	36	
19	37	PD	38	
20	39	PD	40	
21	41	PD	42	
22	43	PD	44	
23	45	PD	46	
24	47	PD	48	Delay=16
25	49	PD	50	
26	51	PD	52	
27	53	PD	54	
28	55	PD	56	
29	57	PD	58	
30	59	PD	60	
31	61	PD	62	
32	63	PD	64	
33	PD	65	66	
34	PD	67	68	
35	PD	69	70	
36	PD	71	72	
37	PD	73	74	
38	PD	75	76	Delay=16
39	PD	77	78	
40	PD	79	80	
41	PD	81	82	
42	PD	83	84	
43	PD	85	86	

44	PD	87	88
45	PD	89	90
46	PD	91	92
47	PD	93	94
48	PD	95	96

To create such RAID 5,

1 **Click the Create virtual volume sets or RAIDs button and select Create Virtual Block RAID & Autodetect** or select **Create Virtual Block RAID & Autodetect** on the **Create** menu

Check that the Apply changes immediately check box is clear on the Parents tab. This will prevent **R-Studio** from trying to start processing the RAID configuration until you specify it completely.

2 **Drug the required objects from the** Drives **pane to the** Parents **tab and select RAID 5 on the RAID type**

⊟ *Other ways to add objects*

- Right-click the Parents tab and select the required partition from the shortcut menu,

or

- Right-click the partition on the Drives panel, select **Add to RAID** on the shortcut menu, and select the RAID object you want to add the partition to.

These objects may be hard drives, logical disks, or images. Check that the objects are correctly placed.

Note: Objects should be placed in the same order as they were in the original RAID 5. If this order is incorrect, you must change it by dragging the parents to place them in the correct order.

⊟ *Object control buttons*

Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Disk	Click this button to add an empty space or missing disk object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID

3 **Specify the Block size and Offset parameters on the** Parents **tab**

   Disregard the Block order field.

4 **Specify the parity delay number in the Parity delay control on the** Parents **tab.**
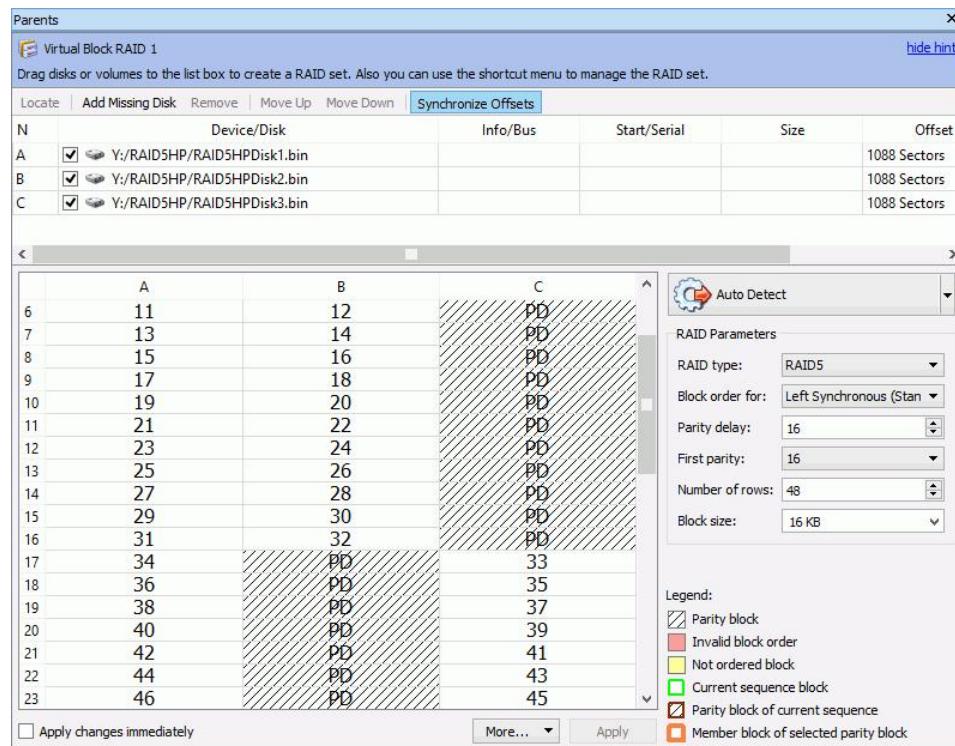
   The number of rows will change to 48.

   ⊟ If necessary, adjust the First parity parameter

   By default, this parameter is set equal to Parity delay. By changing it, you may "shift" the block order table. For example, when the First parity parameter is set as 1 for the RAID 5 of 3 disks with Parity delay of 3., the block order table will be the following:**First parity parameter**

5 **Select Left Asynchronous (Continuous) on the Block Order Field and click the Apply button on the** Parents **tab**

> **The created Virtual Block RAID 1 object can now be processed like regular drives/volumes**

If **R-Studio** detects a valid file system on this RAID object, a partition object will appear on the Drives panel.

The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.

You also may check the RAID consistency, if necessary. See the **Checking RAID Consistency** help page for details.

2.4.6 Working with Advanced RAID Layouts

R-Studio allows you to create and process very complex custom RAID layouts.

Advanced RAID 5

For example, let us create a RAID 5 with the following layout:

- Three disks,
- Block size: 64 KB
- Offset: 32768 sectors (64 KB)
- Block order:

	A	B	C
1	PD	1	2
2	PD	3	4
3	PD	5	6
4	7	PD	8
5	9	PD	10
6	11	PD	12
7	13	14	PD
8	15	16	PD
9	17	18	PD

To create such RAID 5,

1 **Click the Create virtual volume sets or RAIDs button and select Create Virtual Block RAID & Autodetect** or select **Create Virtual Block RAID & Autodetect** on the **Create** menu

Check that the Apply changes immediately check box is clear on the Parents tab. This will prevent **R-Studio** from trying to start processing the RAID configuration until you specify it completely.

2 **Drug the required objects from the** Drives **pane to the** Parents **tab and select RAID 5 on the RAID type**

   ⊟ *Other ways to add objects*
   - Right-click the Parents tab and select the required partition from the shortcut menu,
   or
   - Right-click the partition on the Drives panel, select **Add to RAID** on the shortcut menu, and select the RAID object you want to add the partition to.

   These objects may be hard drives, logical disks, or images. Check that the objects are correctly placed.

   ⊟ *Object control buttons*

Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Disk	Click this button to add an empty space or missing disk object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID

Drives					×
Device/Disk	Label	FS	Start	Size	
Volume{445abf3...	System R...	NTFS	1 MB	100 MB	
C:	System	NTFS	101 MB	121.97 GB	
D:	Data	NTFS	122.07 ...	176.02 GB	
PIONEERDVD-RW DV...			0 Bytes		
E:			0 Bytes		
ST3500320AS	▼	#2 USB	0 Bytes	465.76 GB	
Empty Space25			512 Bytes	7.84 MB	
Y:	Backup II	NTFS	7.88 MB	465.75 GB	
IOMEGAZIP 25032.G		#3 USB	0 Bytes	239.03 MB	
J:		FAT16	16 KB	238.98 MB	
Virtual Volume sets and RAIDs					
Virtual Block RAID 1			0 Bytes		
Image Files					
Y:\RAID5Complex\R...			0 Bytes	897.75 MB	
Y:\RAID5Complex\R...			0 Bytes	897.75 MB	
Y:\RAID5Complex\R...			0 Bytes	897.75 MB	

3   Specify the Block size and Offset parameters on the Parents **tab**

Disregard the Block order field.

4   Manually enter 9 to Number of rows on the Parents **tab**

Block order will change to Custom.

**5   Enter the block order in the table on the** Parents **tab**

Use the RAID Sequence window to move from one row to another.

Using the keyboard: arrow keys to navigate, digit and p keys to enter the block order.

Using the mouse: right-click the cell and select the number or parity from the shortcut menu. If the block table is too large, you better use the keyboard to enter the digits.
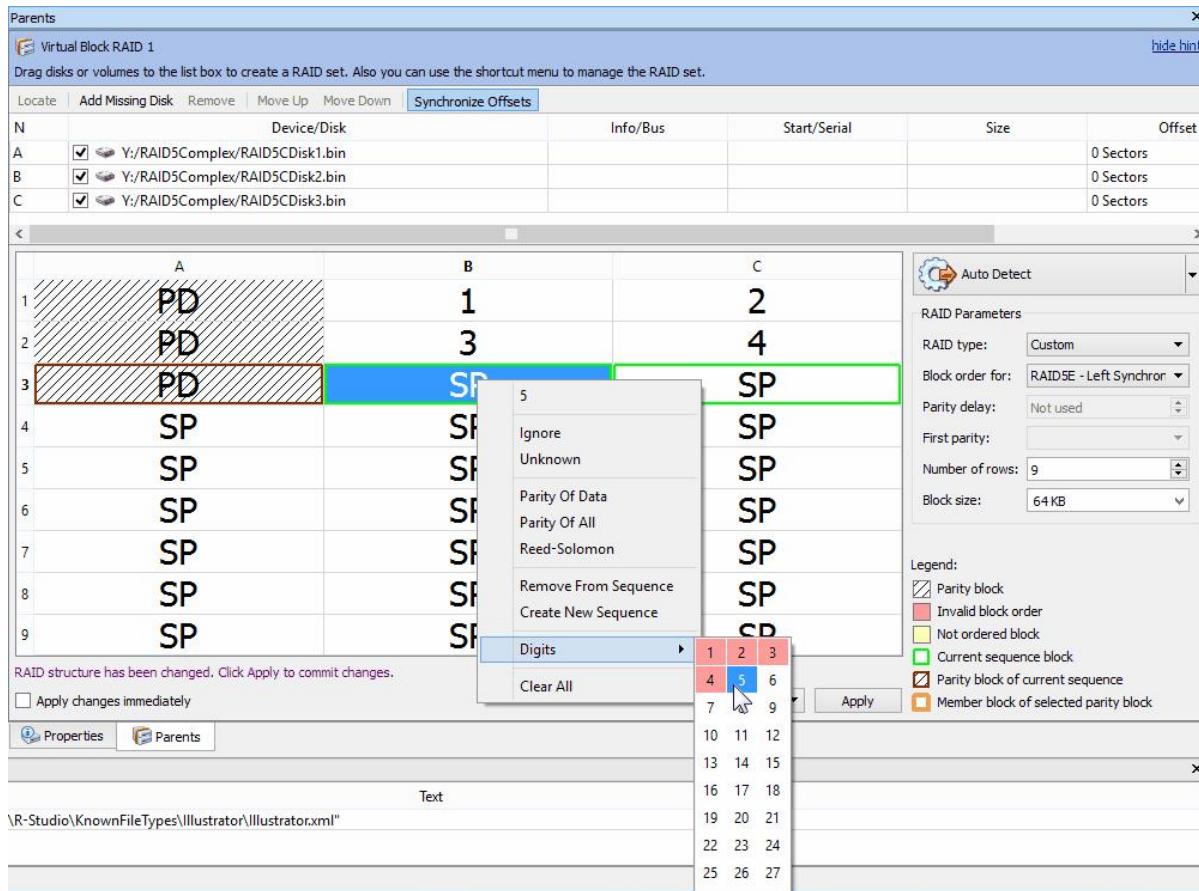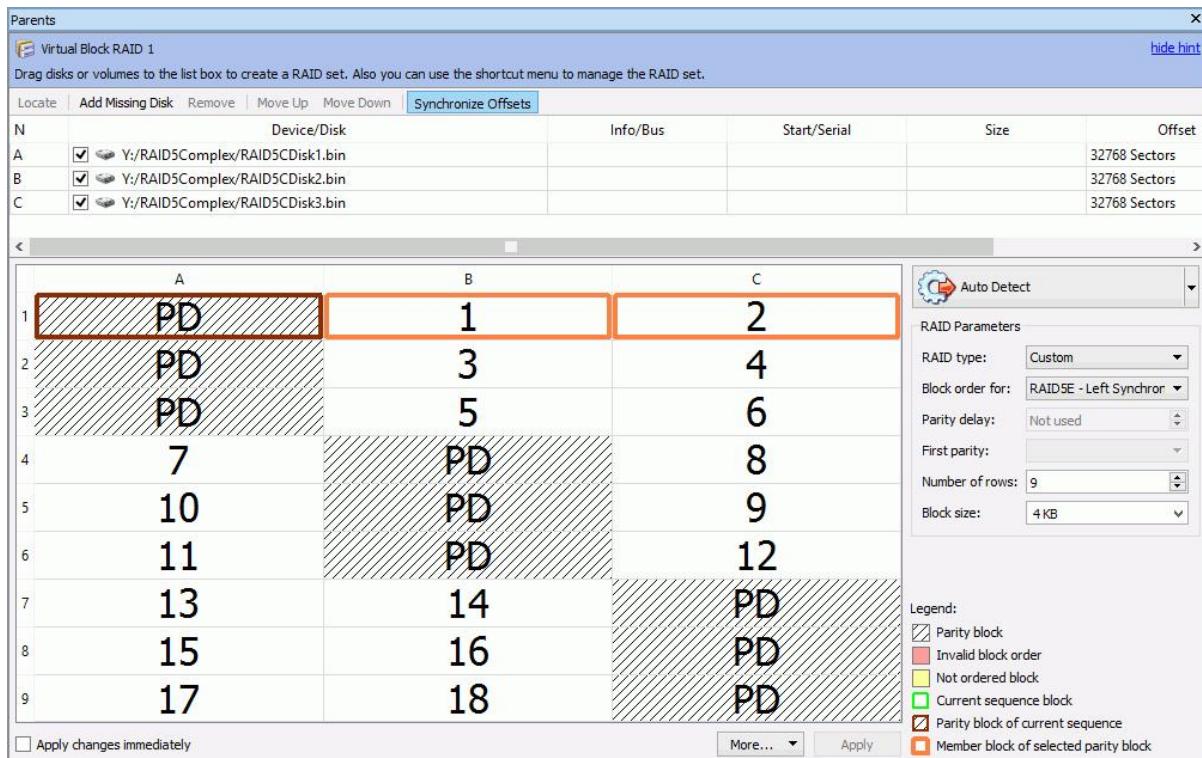
Corrections: **R-Studio** will tell you if some digits are not correct. Navigate to the required cell and enter the correct value. Use the **Delete** key to clear a cell.
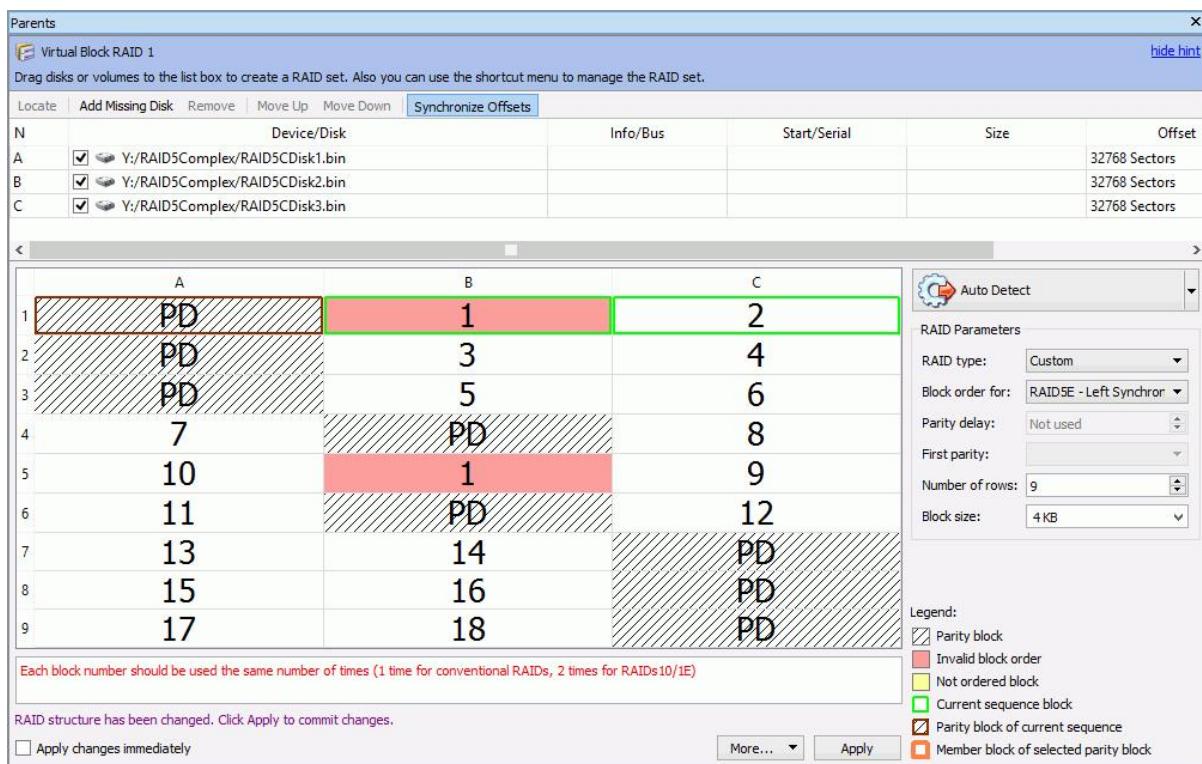
Clear the table: Right-click the table and select **Clear all** on the shortcut menu.

6 **When you finishes entering the information, click the Apply button on the** Parents **tab**

> **The created Virtual Block RAID 1 object can now be processed like regular drives/volumes**

If **R-Studio** detects a valid file system on this RAID object, a partition object will appear on the Drives

panel.

The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.

You also may check the RAID consistency, if necessary. See the **Checking RAID Consistency** help page for details.

Advanced RAID 5

Another example is a RAID with the following layout, similar to that used in Mac Pro internal RAID cards with 4 hard drives.

- Four disks,
- Block size: 512 KB (1024 sectors)
- Offset: 32768 sectors (64 KB)
- Block order:

A	B	C	D	A	B	C	D	A	B	C	D
PD	1	2	PD	3	4	PD	5	6	PD	7	8

As you see, this layout cannot be fit directly into a standard 2D block order table. Still, it's possible to create such RAID layout using the RAID Sequence window.

To create such RAID,

1   **Click the Create virtual volume sets or RAIDs button and select Create Virtual Block RAID & Autodetect** or select **Create Virtual Block RAID & Autodetect** on the **Create** menu

Check that the Apply changes immediately check box is clear on the Parents tab. This will prevent **R-Studio** from trying to start processing the RAID configuration until you specify it completely.

2   **Drug the required objects from the** Drives **pane to the** Parents **tab and select RAID 5 on the RAID type**

⊟ *Other ways to add objects*

- Right-click the Parents tab and select the required partition from the shortcut menu,

or

- Right-click the partition on the Drives panel, select **Add to RAID** on the shortcut menu, and select the RAID object you want to add the partition to.

These objects may be hard drives, logical disks, or images. Check that the objects are correctly placed.

⊟ *Object control buttons*

Locate	Click this button to locate the selected object in the Drives panel.

Add Empty Space/Add Missing Disk	Click this button to add an empty space or missing disk object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID

3 **Specify the Block size and Offset parameters on the** Parents **tab**

Disregard the Block order field.

4 **Manually enter 3 to Number of rows on the** Parents **tab and change Block order to Custom**

5 **Right-click the** RAID Sequence **window and select Remove All. Manually enter 3 to Number of rows on the** Parents **tab and change Block order to Custom**

6 **Right-click Cell 1 in the block order table and select Create New Sequence.**

7 **Right-click Cell 2 in the block order table and select Add to Sequence, do that for Cell 3, too.**

8 **Right-click Cell 4 in the block order table and select Create New Sequence.**

9 **Right-click Cell 5 in the block order table and select Add to Sequence, do that for Cell 6, too.**

Continue those steps for the rest of the table until the RAID Sequence window will have 4 sequences of 3 disks:

Sequences **window**

10 **Select the first line in the** RAID Sequence **window, right-click Cell 1 in the block order table, and select Parity of Data.**

If any unnecessary sequences appear, right-click them in the RAID Sequence window, and select Remove.

11 **Right-click Cell 2 in the block order table and select 1, do that for Cell 3 selecting 2.**

If any unnecessary sequences appear, right-click them in the RAID Sequence window, and select Remove.

11 Move to the next sequence in the RAID Sequence **window and repeat the procedure for cells 4, 5, and 6.**

Do that for the rest of the sequences until you fill all cells in the block order table in the Parents **tab**.

> The created Virtual Block RAID 1 object can now be processed like regular drives/volumes

If **R-Studio** detects a valid file system on this RAID object, a partition object will appear on the Drives panel.

The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.

You also may check the RAID consistency, if necessary. See the **Checking RAID Consistency** help page for details.

Advanced RAID 6 Layout

For example, let us create a RAID 6 with the following layout:

- Five disks,
- Block size: 64 KB
- Offset: 0
- Block order:

	A	B	C	D	E
1	RS	1	2	3	PD
2	4	5	6	PD	RS
3	8	9	PD	RS	7
4	12	PD	RS	10	11
5	PD	RS	13	14	15
6	PA	PA	PA	PA	PA

where

   PD is parity of data;

   PA is parity of all;

   RS is Reed-Solomon;

Rows from 1 to 5 use two types of error correction: parity of data (xor) and Reed-Solomon. That is, row 1 uses blocks A1 and E1, row 2 uses blocks D2 and E2, and so on.

Row 6 is used for error correction for columns. That is, column A uses block A6, column B uses B6, and so on.

Parity of all is used for error correction.

1 **Click the Create virtual volume sets or RAIDs button and select Create Virtual Block RAID & Autodetect**
or select **Create Virtual Block RAID & Autodetect** on the **Create** menu

Check that the Apply changes immediately check box is clear on the Parents tab. This will prevent **R-Studio** from trying to start processing the RAID configuration until you specify it completely.

2 **Drug the required objects from the** Drives **pane to the** Parents **tab and select Custom on the RAID type**

   ⊟ *Other ways to add objects*

   • Right-click the Parents tab and select the required partition from the shortcut menu,

   or

   • Right-click the partition on the Drives panel, select **Add to RAID** on the shortcut menu, and select the RAID object you want to add the partition to.

These objects may be hard drives, logical disks, or images. Check that the objects are correctly placed.

   ⊟ *Object control buttons*

Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Disk	Click this button to add an empty space or missing disk object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID

Drives				×
Device/Disk	Label	FS	Start	Size
▲ 🖳 Local Computer				
▷ 🖴 WDC WD75DA-00AWA107...	WD-WMA1J126...	#0 AT...	0 Bytes	6.99 GB
▷ 🖴 ST3320418ASCC44	9VMMRZKW	#1 SA...	0 Bytes	298.09 GB
▷ 🖴 PIONEERDVD-RW DVR-21...			0 Bytes	
▷ 🖴 IOMEGAZIP 25032.G		#2 USB	0 Bytes	239.03 MB
▲ 🖴 ST3500320AS	▼	#3 USB	0 Bytes	465.76 GB
☁ Empty Space26			512 Bytes	7.84 MB
🖴 Y:	▼ Backup II	NTFS	7.88 MB	465.75 GB
▲ Virtual Volume sets and RAIDs				
🖪 Virtual Block RAID 1			0 Bytes	
▲ 📁 Image Files				
🖴 Y:\RAID6Complex\img1.bin			0 Bytes	897.75 MB
🖴 Y:\RAID6Complex\img2.bin		NTFS	0 Bytes	897.75 MB
🖴 Y:\RAID6Complex\img3.bin			0 Bytes	897.75 MB
🖴 Y:\RAID6Complex\img4.bin			0 Bytes	897.75 MB
🖴 Y:\RAID6Complex\img5.bin			0 Bytes	897.75 MB

3 **Specify the Block size and Offset parameters on the** Parents **tab**

Disregard the Block order parameter.

**4** **Manually enter 6 to Number of rows on the** Parents **tab**

5 **Enter the block order in the table on the** Parents **tab**

You may enter either a block number, or an error correction block of the following types:

PD	Parity of data
PA	Parity of all

RS	Reed-Solomon
SP	Spare Part
I	Ignore

Note: You should specify an error correction block only when the correct sequence is selected on the RAID Sequences window.
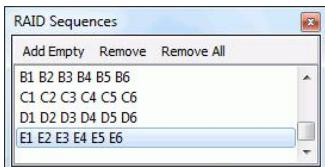
Using the keyboard: arrow keys to navigate, digit, and rs, pd, pa, u, i keys to enter the block order.

Using the mouse: right-click the cell and select the number or parity from the shortcut menu. If the block table is too large, you better use the keyboard to enter the digits.

For the rows:

Select the required row sequence on the RAID Sequences window, select the cell on the RAID table, and enter the required value. **R-Studio** automatically generates those sequences when you add RAID parents.

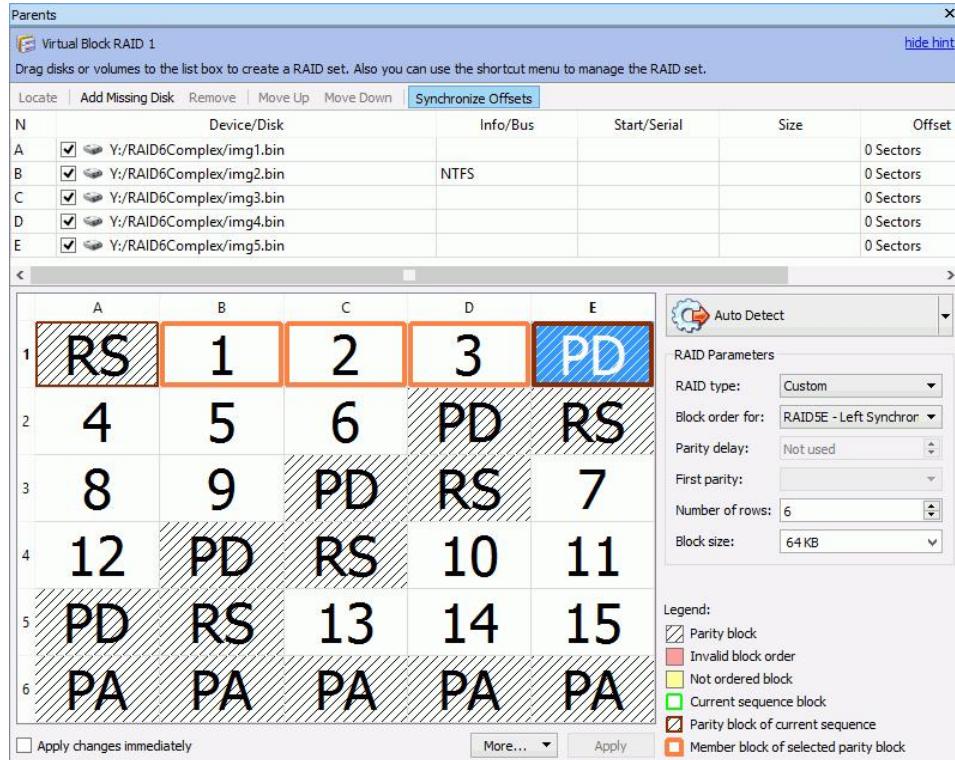*For the columns and arbitrary sequences:*

You need to create those sequences and add the respective blocks to it manually.

To create a sequence: Click **Add empty** on the RAID Sequences window or select **Create New Sequence** on the shortcut menu on the Parents tab.

To add a block to a sequence: Right-click the respective cell and select **Add To Sequence** on the shortcut menu on the Parents tab.

To remove a block to a sequence: Right-click the respective cell and select **Remove From Sequence** on the shortcut menu on the Parents tab.

6   When you finishes entering the information, click the Apply button on the Parents **tab**

> **The created Virtual Block RAID 1 object can now be processed like regular drives/volumes**

If **R-Studio** detects a valid file system on this RAID object, a partition object will appear on the Drives panel.

The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.

You also may check the RAID consistency, if necessary. See the **Checking RAID Consistency** help page for details.

2.4.7   Nested and Non-Standard RAID Levels

- **RAID10 (1+0)**
- **RAID1E**

- **[RAID5E](#)**
- **[RAID5EE](#)**
- **[RAID6E](#)**

2.4.7.1 RAID10 (1+0)

A RAID 10 (or 1+0) is a stripe of mirrors. Its block order can be represented as:

	A	B	C	D
1	1	1	2	2

To create a RAID 10 object

1 **Click the Create Virtual RAID button and select Create Virtual Block RAID & Autodetect**
or select the **Create Virtual Block RAID & Autodetect** on the **Create** menu

> **A Virtual Block RAID object will appear on the** Drives **panel**
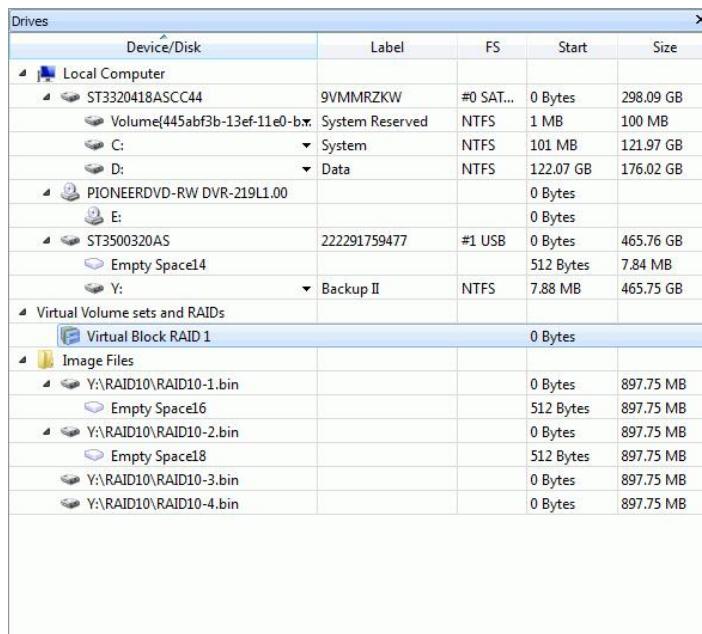
2 **Drag the required partitions from the** Drives **panel to the** Parents **tab**

⊟ *Other ways to add objects*

- Right-click the Parents tab and select the required partition from the shortcut menu,
or
- Right-click the partition on the Drives panel, select **Add to RAID** on the shortcut menu, and select the RAID object you want to add the partition to.

3 **Select RAID 10 on the RAID type**

You may either make **R-Studio** to process your changes immediately or wait until you finish editing the RAID layout. Select or clear the Apply changes immediately checkbox on the Parents tab. Click the **Apply** button to apply the changes when are you through.

Note: Objects should be placed in the same order as they were in the original RAID 10. If this order is incorrect, you must change it by dragging the parents to place them in the correct order.

☐ *Object control buttons*

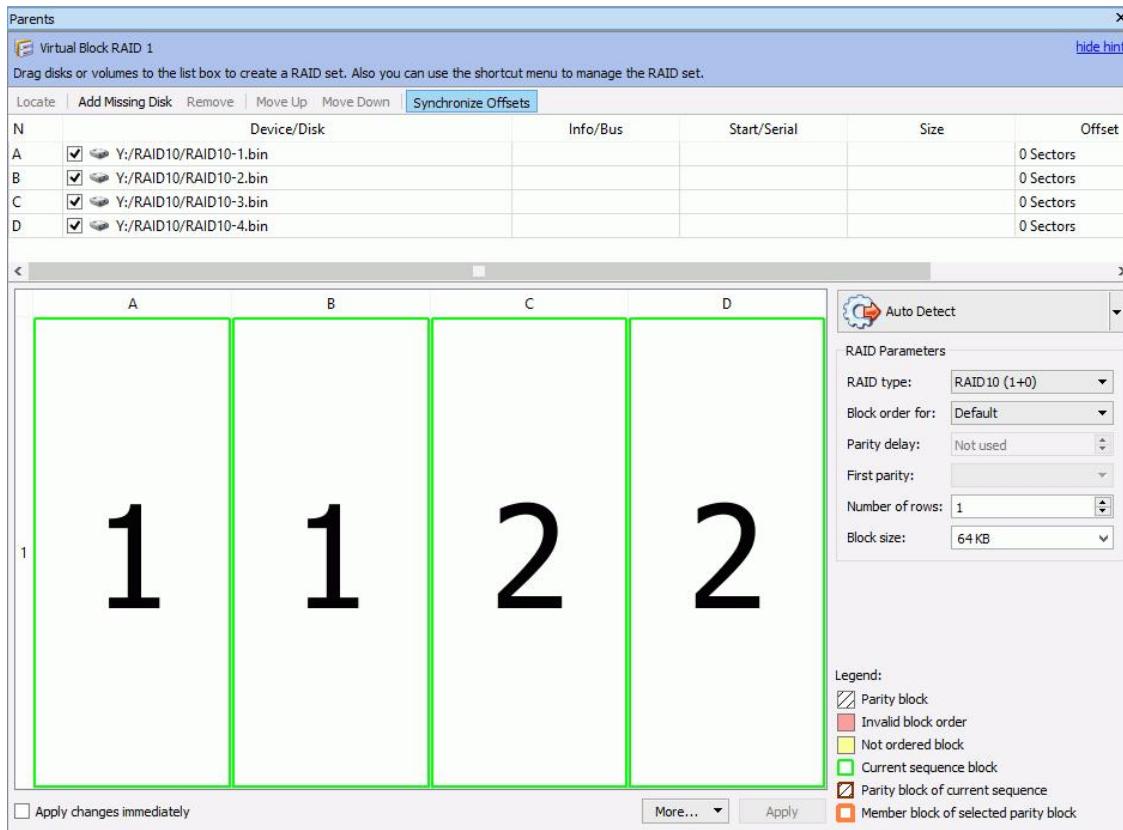| Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Disk	Click this button to add an empty space or missing disk object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID

The RAID block size and Offset (in sectors) parameters must be set the same as for the original RAID 10.

You also need to specify Block order for virtual RAID 10. You may select it on the Block order drop-down or shortcut menu.

If the those parameters are not correct, data on the parents will not be damaged, but files from the RAID 10 cannot be recovered.

Note: You may check how correctly you have reconstructed the original RAID 10. Find a file and preview it. If the file appears correct, you have created a correct RAID 10 layout.

Parents **tab**

> **The *RAID 10* object can now be processed like regular drives/volumes**

If **R-Studio** detects a valid file system on the newly created RAID object, a partition object will appear on the Drives panel.

The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.

You also may check the RAID consistency, if necessary. See the **Checking RAID Consistency** help page for details.

2.4.7.2   RAID1E

RAID 1E is utilizes both the mirroring and striping: data is striped across all drives, as in RAID 0. Additionally, a copy of each stripe is stored on a different drive, as in RAID 1. Its block order can be represented as:

	A	B	C
1	1	1	2
2	2	3	3

To create a RAID 1E object

1   Click the Create Virtual RAID button and select Create Virtual Block RAID & Autodetect

or select the **Create Virtual Block RAID & Autodetect** on the **Create** menu

> **A Virtual Block RAID object will appear on the** Drives **panel**

Device/Disk	Label	FS	Start	Size
▲ 🖳 Local Computer				
▲ 🖴 ST3320418ASCC44	9VMMRZKW	#0 SATA...	0 Bytes	298.09 GB
🖴 Volume{445abf3b-13ef-11e0-b147.▼	System Reserved	NTFS	1 MB	100 MB
🖴 C: ▼	System	NTFS	101 MB	121.97 GB
🖴 D: ▼	Data	NTFS	122.07 GB	176.02 GB
▲ 💿 PIONEERDVD-RW DVR-219L1.00			0 Bytes	
💿 E:			0 Bytes	
▲ 🖴 ST3500320AS	222291759477	#1 USB	0 Bytes	465.76 GB
🖴 Empty Space14			512 Bytes	7.84 MB
🖴 Y: ▼	Backup II	NTFS	7.88 MB	465.75 GB
▲ Virtual Volume sets and RAIDs				
📄 Virtual Block RAID 1			0 Bytes	
▲ 📁 Image Files				
🖴 Y:\RAID1E\RAID1EDisk1.bin		NTFS	0 Bytes	897.75 MB
🖴 Y:\RAID1E\RAID1EDisk2.bin			0 Bytes	897.75 MB
🖴 Y:\RAID1E\RAID1EDisk3.bin			0 Bytes	897.75 MB

2 **Drag the required partitions from the** Drives **panel to the** Parents **tab**

⊟ *Other ways to add objects*

- Right-click the Parents tab and select the required partition from the shortcut menu,

or

- Right-click the partition on the Drives panel, select **Add to RAID** on the shortcut menu, and select the RAID object you want to add the partition to.

3 **Select RAID 1E on the RAID type**

You may either make **R-Studio** to process your changes immediately or wait until you finish editing the RAID layout. Select or clear the Apply changes immediately checkbox on the Parents tab. Click the **Apply** button to apply the changes when are you through.

Note: Objects should be placed in the same order as they were in the original RAID 1E. If this order is incorrect, you must change it by dragging the parents to place them in the correct order.

⊟ *Object control buttons*

Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Disk	Click this button to add an empty space or missing disk object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID

The RAID block size and Offset (in sectors) parameters must be set the same as for the original RAID 1E.

You also need to specify Block order for virtual RAID 1E You may select it on the Block order drop-down or shortcut menu.

If the those parameters are not correct, data on the parents will not be damaged, but files from the RAID 1E cannot be recovered.

Note: You may check how correctly you have reconstructed the original RAID 1E. Find a file and preview

it. If the file appears correct, you have created a correct RAID 1E layout.

Parents **tab**

> **The** *RAID 1E* **object can now be processed like regular drives/volumes**

If **R-Studio** detects a valid file system on the newly created RAID object, a partition object will appear on the Drives panel.

The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.

You also may check the RAID consistency, if necessary. See the **Checking RAID Consistency** help page for details.

2.4.7.3 RAID5E

RAID 5E (where E stands for Enhanced) is a RAID 5 layout with an integrated hot-spare drive, where the spare drive is an active part of the block rotation scheme. An example of such RAID layout is in the table below:

	A	B	C	D
1	1	2	3	PD
2	5	6	PD	4
3	9	PD	7	8
4	PD	10	11	12
5	SP	SP	SP	SP

where PD and SP stand for Parity of Data and Spare Part.

To create a RAID 5E object

1 **Click the Create Virtual RAID button and select Create Virtual Block RAID & Autodetect**

or select the **Create Virtual Block RAID & Autodetect** on the **Create** menu

> **A Virtual Block RAID object will appear on the** Drives **panel**

2 **Drag the required partitions from the** Drives **panel to the** Parents **tab**

⊟ *Other ways to add objects*

- Right-click the Parents tab and select the required partition from the shortcut menu,

or

- Right-click the partition on the Drives panel, select **Add to RAID** on the shortcut menu, and select the RAID object you want to add the partition to.

3 **Select RAID 5E on the RAID type**

You may either make **R-Studio** to process your changes immediately or wait until you finish editing the RAID layout. Select or clear the Apply changes immediately checkbox on the Parents tab. Click the **Apply** button to apply the changes when are you through.

Note: Objects should be placed in the same order as they were in the original RAID 5E. If this order is incorrect, you must change it by dragging the parents to place them in the correct order.

☐ *Object control buttons*

Locate	Click this button to locate the selected object in the `Drives` panel.
Add Empty Space/Add Missing Disk	Click this button to add an empty space or missing disk object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID

The `RAID block size` and `Offset` (in sectors) parameters must be set the same as for the original RAID 5E.

You also need to specify `Block order` for virtual RAID 5E You may select it on the `Block order` drop-down or shortcut menu.

If the those parameters are not correct, data on the parents will not be damaged, but files from the RAID 5E cannot be recovered.

Note: You may check how correctly you have reconstructed the original RAID 5E. Find a file and preview it. If the file appears correct, you have created a correct RAID 5E layout.

Parents **tab**

> The *RAID 5E* object can now be processed like regular drives/volumes

If **R-Studio** detects a valid file system on the newly created RAID object, a partition object will appear on the Drives panel.

The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.

You also may check the RAID consistency, if necessary. See the **Checking RAID Consistency** help page for details.
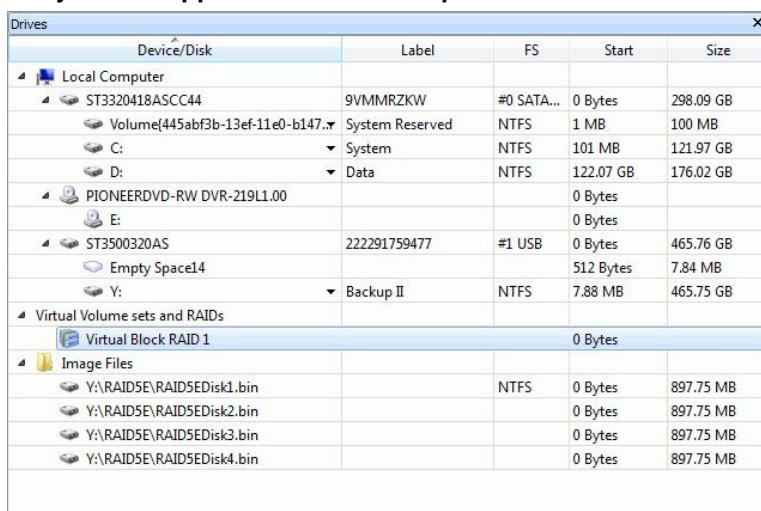
2.4.7.4 RAID5EE

RAID 5EE (where E stands for Enhanced) is a RAID 5 layout with an integrated hot-spare drive, where the spare drive is an active part of the block rotation scheme. An example of such RAID layout is in the table below:

	A	B	C	D
1	1	2	SP	PD
2	4	SP	PD	3
3	SP	PD	5	6
4	PD	7	8	SP

where PD and SP stand for Parity of Data and Spare Part.

To create a RAID 5EE object

1 **Click the Create Virtual RAID button and select Create Virtual Block RAID & Autodetect**

or select the **Create Virtual Block RAID & Autodetect** on the **Create** menu

> **A Virtual Block RAID object will appear on the** Drives **panel**

2 **Drag the required partitions from the** Drives **panel to the** Parents **tab**

■ *Other ways to add objects*

* Right-click the Parents tab and select the required partition from the shortcut menu,

or

* Right-click the partition on the Drives panel, select **Add to RAID** on the shortcut menu, and select the RAID object you want to add the partition to.

3 **Select RAID 5EE on the RAID type**

You may either make **R-Studio** to process your changes immediately or wait until you finish editing the RAID layout. Select or clear the Apply changes immediately checkbox on the Parents tab. Click the **Apply** button to apply the changes when are you through.

Note: Objects should be placed in the same order as they were in the original RAID 5EE. If this order is incorrect, you must change it by dragging the parents to place them in the correct order.

■ *Object control buttons*

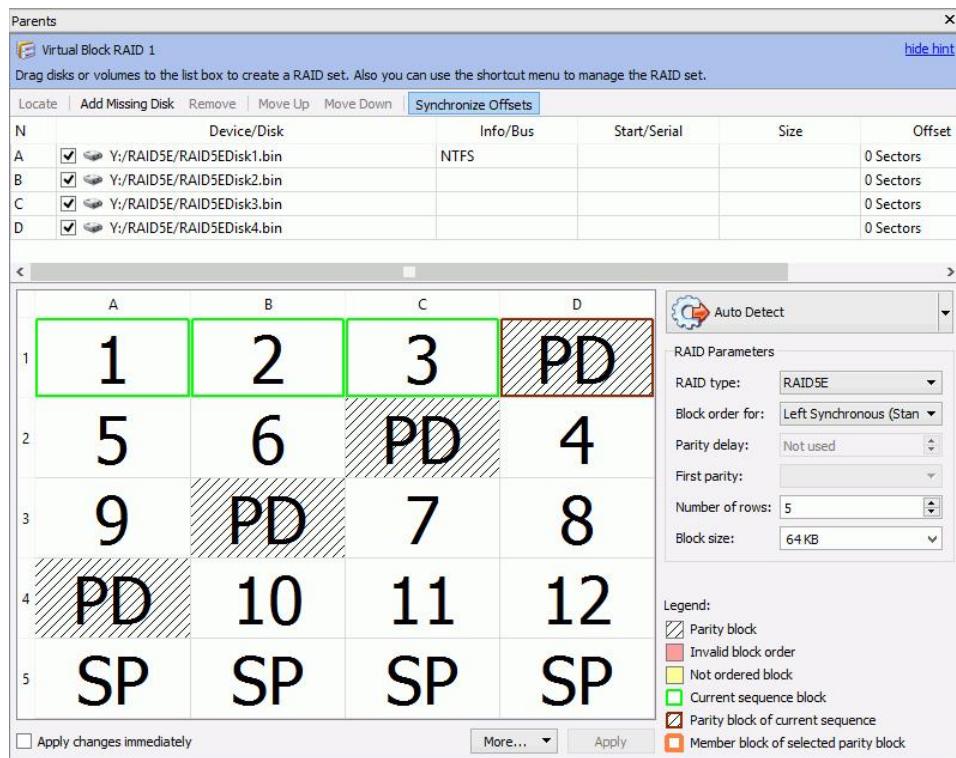| Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Disk	Click this button to add an empty space or missing disk object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID

The RAID block size and Offset (in sectors) parameters must be set the same as for the original RAID 5EE.

You also need to specify Block order for virtual RAID 5EE You may select it on the Block order drop-down or shortcut menu.

If the those parameters are not correct, data on the parents will not be damaged, but files from the RAID 5EE cannot be recovered.

Note: You may check how correctly you have reconstructed the original RAID 5EE. Find a file and preview

it. If the file appears correct, you have created a correct RAID 5EE layout.

Parents **tab**

> **>** **The *RAID 5EE* object can now be processed like regular drives/volumes**

If **R-Studio** detects a valid file system on the newly created RAID object, a partition object will appear on the Drives panel.

The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.

You also may check the RAID consistency, if necessary. See the **Checking RAID Consistency** help page for details.

2.4.7.5 RAID6E

RAID 6E (where E stands for Enhanced) is a RAID 6 layout with an integrated hot-spare drive, where the spare drive is an active part of the block rotation scheme. An example of such RAID layout is in the table below:

	A	B	C	D	E	F
1	RS	1	2	3	4	PD
2	5	6	7	8	PD	RS
3	10	11	12	PD	RS	9
4	15	16	PD	RS	13	14
5	20	PD	RS	17	18	19
6	PD	RS	21	22	23	24
7	SP	SP	SP	SP	SP	SP

where RS, PD and SP stand for Reed-Solomon, Parity of Data, and Spare Part, respectively.

To create a RAID 6E object

1   Click the Create Virtual RAID button and select Create Virtual Block RAID & Autodetect

or select the **Create Virtual Block RAID & Autodetect** on the **Create** menu

>   A Virtual Block RAID object will appear on the Drives **panel**

2   Drag the required partitions from the Drives **panel to the** Parents **tab**

⊟ *Other ways to add objects*

● Right-click the Parents tab and select the required partition from the shortcut menu,

or

● Right-click the partition on the Drives panel, select **Add to RAID** on the shortcut menu, and select the RAID object you want to add the partition to.

3   Select RAID 6E on the RAID type

You may either make **R-Studio** to process your changes immediately or wait until you finish editing the RAID layout. Select or clear the Apply changes immediately checkbox on the Parents tab. Click the **Apply** button to apply the changes when are you through.

Note: Objects should be placed in the same order as they were in the original RAID 6E. If this order is

incorrect, you must change it by dragging the parents to place them in the correct order.

⊟ *Object control buttons*

Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Disk	Click this button to add an empty space or missing disk object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID

The RAID block size and Offset (in sectors) parameters must be set the same as for the original RAID 6E.

You also need to specify Block order for virtual RAID 6E You may select it on the Block order drop-down or shortcut menu.

If the those parameters are not correct, data on the parents will not be damaged, but files from the RAID 6E cannot be recovered.

Note: You may check how correctly you have reconstructed the original RAID 6E. Find a file and preview it. If the file appears correct, you have created a correct RAID 6E layout.

Drives				×
Device/Disk	Label	FS	Start	Size
▲ 💻 Local Computer				
▲ 💿 ST3320418ASCC44	9VMMRZKW	#0 SATA...	0 Bytes	298.09 GB
💿 Volume{445abf3b-13ef-11e0-b147.▾	System Reserved	NTFS	1 MB	100 MB
💿 C: ▾	System	NTFS	101 MB	121.97 GB
💿 D: ▾	Data	NTFS	122.07 GB	176.02 GB
▲ 💿 PIONEERDVD-RW DVR-219L1.00			0 Bytes	
💿 E:			0 Bytes	
▲ 💿 ST3500320AS	222291759477	#1 USB	0 Bytes	465.76 GB
💿 Empty Space14			512 Bytes	7.84 MB
💿 Y: ▾	Backup II	NTFS	7.88 MB	465.75 GB
▲ Virtual Volume sets and RAIDs				
▲ 📁 **Virtual Block RAID 1**		**NTFS**	**0 Bytes**	**3.01 GB**
💿 Direct Volume		NTFS	0 Bytes	3.01 GB
▲ 📁 Image Files				
💿 Y:\RAID6E\RAID6E1.bin			0 Bytes	897.75 MB
💿 Y:\RAID6E\RAID6E2.bin		NTFS	0 Bytes	897.75 MB
💿 Y:\RAID6E\RAID6E3.bin			0 Bytes	897.75 MB
💿 Y:\RAID6E\RAID6E4.bin			0 Bytes	897.75 MB
💿 Y:\RAID6E\RAID6E5.bin			0 Bytes	897.75 MB
💿 Y:\RAID6E\RAID6E6.bin			0 Bytes	897.75 MB

Parents **tab**
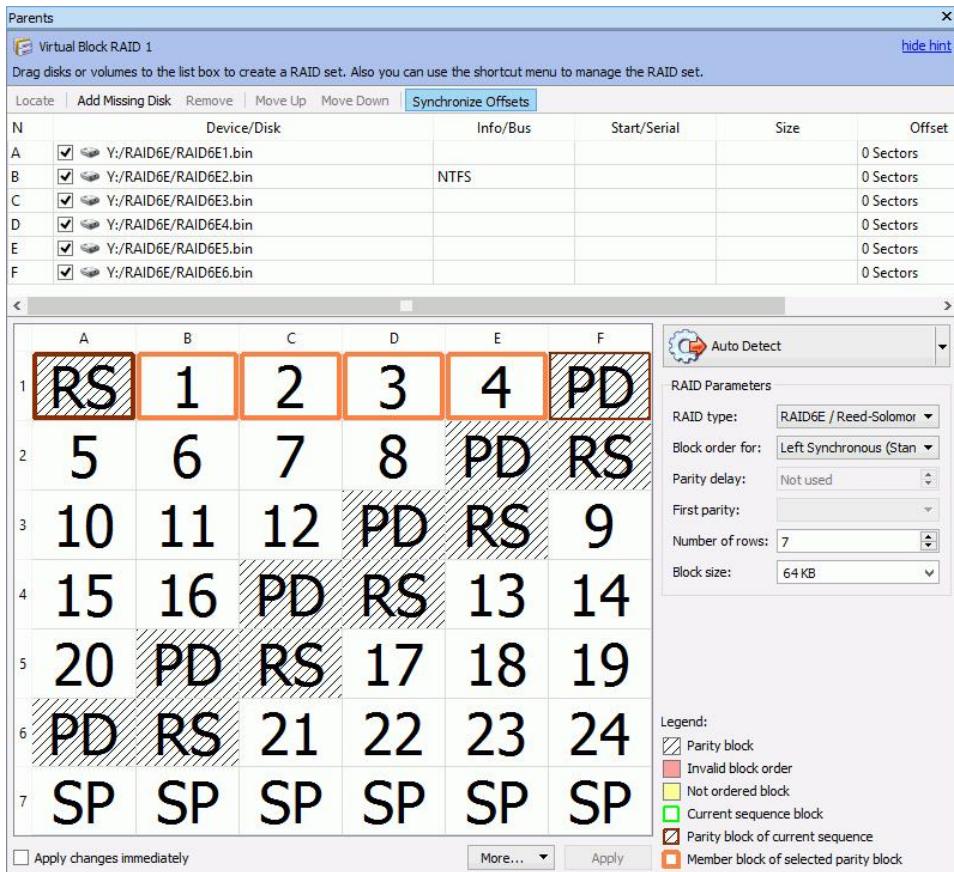
> **The *RAID 6E* object can now be processed like regular drives/volumes**

If **R-Studio** detects a valid file system on the newly created RAID object, a partition object will appear on the Drives panel.

The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.

You also may check the RAID consistency, if necessary. See the **Checking RAID Consistency** help page for details.
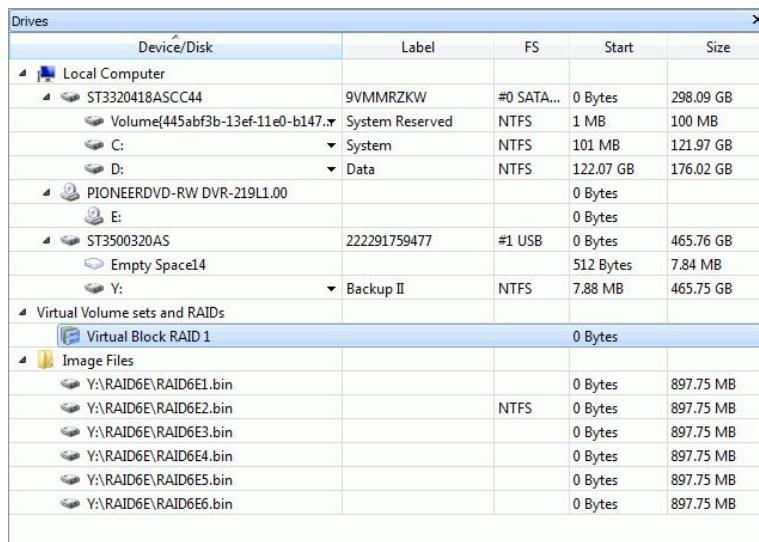
2.4.8   Finding RAID Parameters

R-Studio can find parameters for RAID 5 and 6. RAID parameters can be found automatically or manually.

The number of disks in the RAID should be between 3 and 32.

To find RAID parameters automatically,

1   **Click the Auto Detect button on the** Parents **tab**

> **R-Studio will start searching for the RAID parameters and show the most probable one on the** RAID Parameter Detection **dialog box**

RAID Parameter Detection **dialog box**
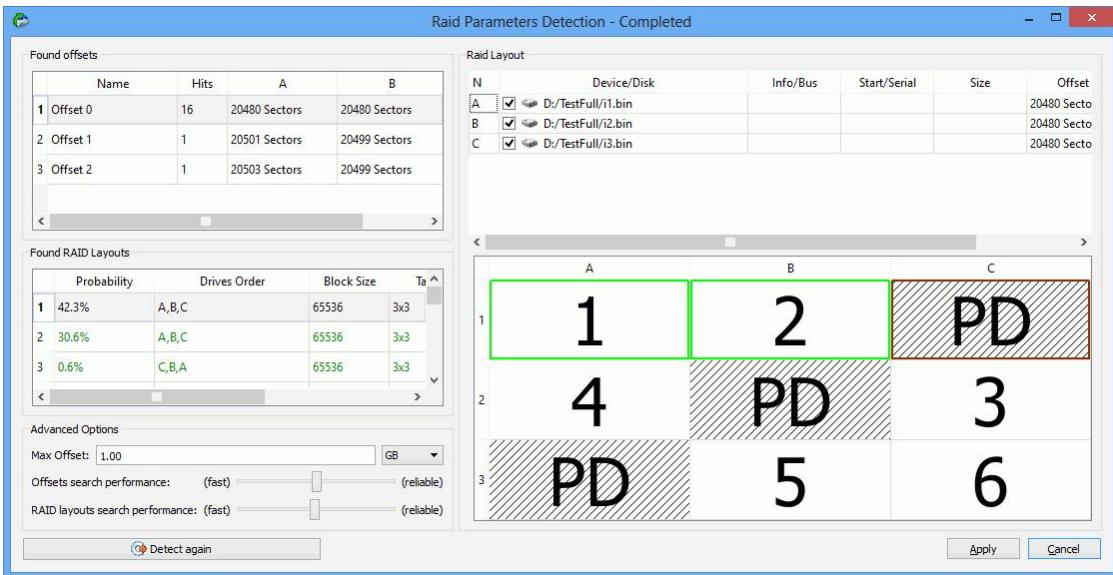
2 **Click the Apply button and** **R-Studio** **will change the RAID layout to the selected one on the** Parents **tab.**

3 **Click the Apply button on the on the** Parents **tab and**

> **R-Studio will use the found parameters for the RAID.**

If necessary, you may return to the RAID Parameter Detection dialog box by clicking the **Choose Variants** button, and select another RAID layout.

To find RAID parameters manually,

1 **Click the drop-down Auto Detect list on the** Parents **tab and select Advanced Detection.**

2 **Specify the necessary detection parameters on the** RAID Parameter Detection **dialog box and click the Start detection button**

RAID Layout Autodetect **dialog box**
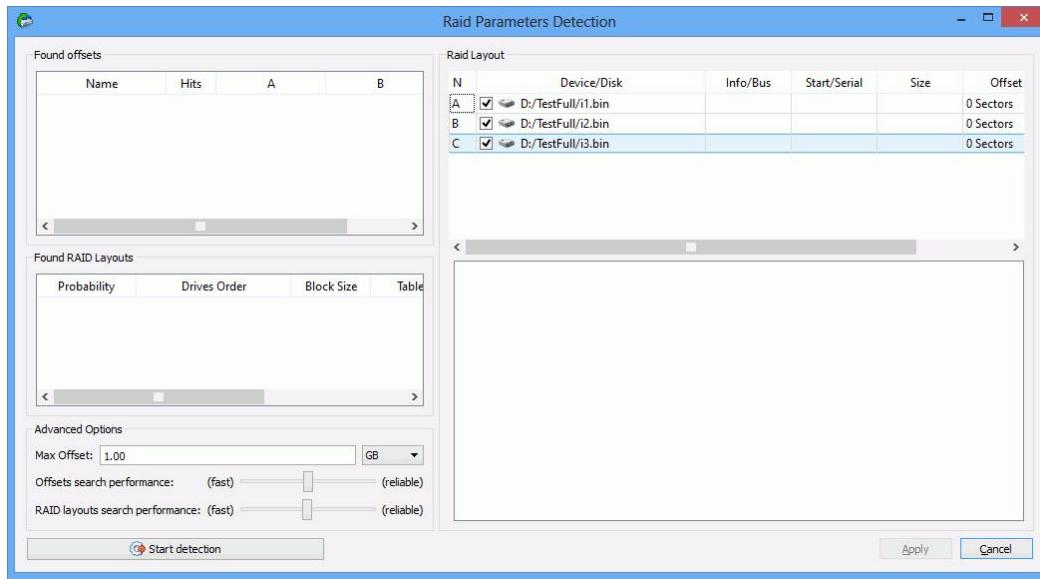
You may change the disk order, offset for disk(s), and enable /disable disks.

⊟ Advanced Parameters

Max offset:	The area on the disk to find RAID parameters in.
Offset search performance RAID layouts search performance	Cumulative parameters that estimates the probability of certain found RAID parameters. Moving it to the right increases accuracy but slows the process. Moving it to the left reduces the accuracy but makes the process faster.

3 **Select an offset and click the Load button on the** RAID Layout Autodetect **dialog box**

RAID Layout Autodetect **dialog box**
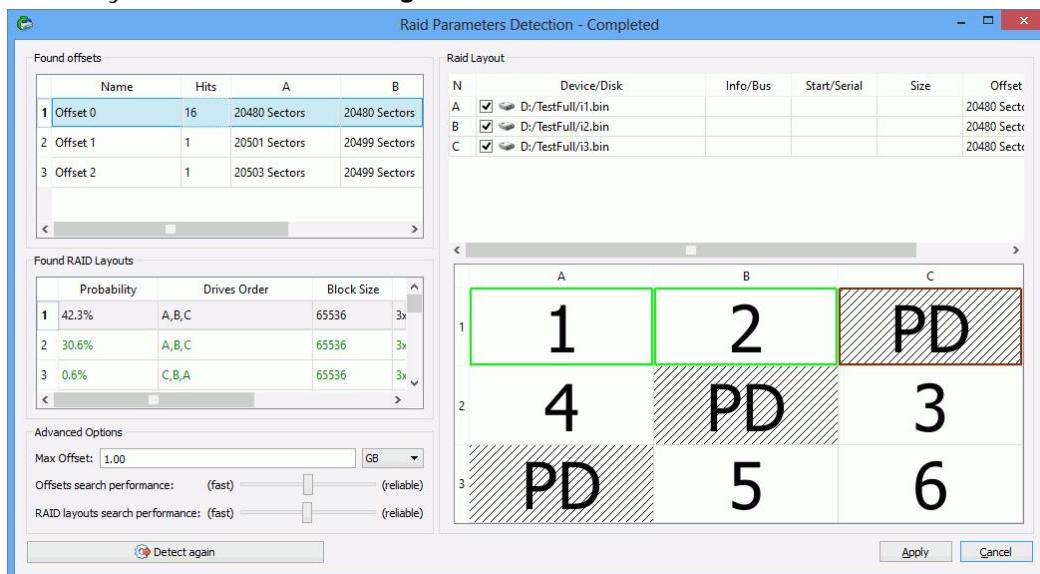
You may add your own RAID offsets. Right-click empty space on the **Found offsets** pane and select **Add Custom offset** on the shortcut menu and specify the offset individually for every disk.

4   Select a RAID variant on the Found RAID layouts pane and click the Apply button

5   Click the Apply button on the on the Parents tab and

>   R-Studio will use the found parameters for the RAID.

If necessary, you may return to the RAID Parameter Detection dialog box by clicking the **Choose Variants** button, and select another RAID layout.

2.4.9   Checking RAID Consistency

You may check RAID consistency (whether the data parity values are valid) for RAID layouts with parity blocks.

To check RAID consistency,

*   Right-click the RAID and select Check RAID consistency... on the shortcut menu

>   The RAID consistency check window will appear showing the progress.

RAID consistency check **window**
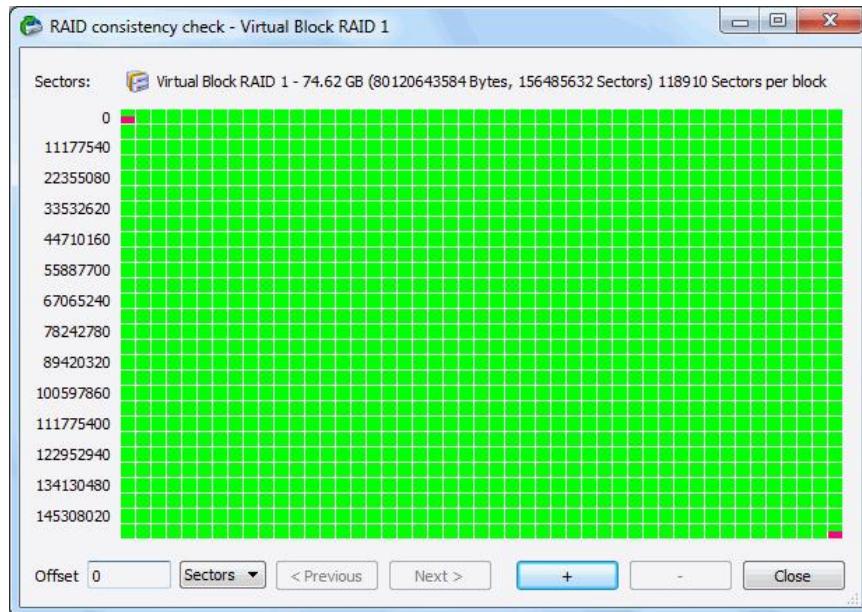
When the check is finished, you may inspect the results.

Block color	
Green	Data parity values are valid.
Red	Data parity values are not valid.
White	0's

When a mouse pointer hovers over a block, a tooltip will show the sector range within the block and number of consistent and inconsistent sectors. Double-clicking the block moves it to the upper-leftmost corner and zooms in the data by 2.

⊟ *RAID consistency check controls*

Sectors	The number of the first sector in the row.
Offset	Offset in the data. Enter the address you want to jump to and press the **Enter** key.

Sectors/Bytes/KB...	Specifies the dimension of the data in the **Offset** field.
Previous/Next	Moves to the previous/next part of the data.
+/-	Zooms into/out of, the data.

2.4.10 Syntax of a Description File for RAID Configurations

You may create and store your own RAID configurations The syntax of those files is similar to that of the XML language. They are stored in an `.xml` file specified on the **R-Studio Settings**.

A number of file examples are shown on the **Description Files for RAID Configurations** topic.

RAID configuration file example

```
<RAIDList>
  <RAID name="RAID6Complex" parents="5" rows="6" blocksize="16777216">
    <Table>
      <Block id="A1">ReedSolomon</Block>
      <Block id="B1">1</Block>
      <Block id="C1">2</Block>
      <Block id="D1">3</Block>
      <Block id="E1">XorOfData</Block>
      <Block id="A2">4</Block>
      <Block id="B2">5</Block>
      <Block id="C2">6</Block>
      <Block id="D2">XorOfData</Block>
      <Block id="E2">ReedSolomon</Block>
      <Block id="A3">8</Block>
      <Block id="B3">9</Block>
      <Block id="C3">XorOfData</Block>
      <Block id="D3">ReedSolomon</Block>
      <Block id="E3">7</Block>
      <Block id="A4">12</Block>
      <Block id="B4">XorOfData</Block>
      <Block id="C4">ReedSolomon</Block>
      <Block id="D4">10</Block>
      <Block id="E4">11</Block>
      <Block id="A5">XorOfData</Block>
      <Block id="B5">ReedSolomon</Block>
      <Block id="C5">13</Block>
      <Block id="D5">14</Block>
      <Block id="E5">15</Block>
      <Block id="A6" sequence="1">XorOfAll</Block>
      <Block id="B6" sequence="2">XorOfAll</Block>
      <Block id="C6" sequence="3">XorOfAll</Block>
      <Block id="D6" sequence="4">XorOfAll</Block>
      <Block id="E6" sequence="5">XorOfAll</Block>
    </Table>
    <Sequences>
      <Sequence id="1">A1 A2 A3 A4 A5 A6</Sequence>
      <Sequence id="2">B1 B2 B3 B4 B5 B6</Sequence>
      <Sequence id="3">C1 C2 C3 C4 C5 C6</Sequence>
      <Sequence id="4">D1 D2 D3 D4 D5 D6</Sequence>
      <Sequence id="5">E1 E2 E3 E4 E5 E6</Sequence>
    </Sequences>
  </RAID>
```

```
</RAIDList>
```

File structure

File header

The file starts with a standard XML header:

```
<?xml version="1.0" encoding="utf-8"?>
```

Section RAIDList

```
<RAIDList>
```

It can contain any number of the `<RAID>` sections and requires a closing element `</FileTypeList>`.

Section structure example:

```
<RAIDList>
  <RAID [attributes]>
    ...
  </RAID>
  ...
  <RAID [attributes]>
    ...
  </RAID>
```

Section RAID

This section describes each RAID layout.

It must contain at least one `<Table>` section and can contain one block `<Sequences>` and one block `<Offsets>`.

Attributes:

name	`<string>`	Optional	The name of the RAID layout
parents	`<u16>`	Required	The number of parent objects
rows	`<u16>`	Required	The number of rows in the RAID layout table.
blocksize	`<u32>`	Required	The block size of the RAID in bytes.

Section structure example:

```
<RAIDList>
  <RAID name="example" parents="2" rows="2" blocksize="16777216">
    <Table>
      ...
    </Table>
    <Sequences>
      ...
    </Sequences>
    <Offsets>
      ...
    </Offsets>
  </RAID>
</RAIDList>
```

Section Table

This section describes the RAID layout table. It contains the `<Block>` elements which number is a product of two attributes in the `<RAID>` section: `<parents>` x `<rows>`.

Section structure example:

```
<RAIDList>
```

```
<RAID name="example" parents="2" rows="2" blocksize="16777216">
  <Table>
    <Block [attributes]> ... </Block>
    <Block [attributes]> ... </Block>
    <Block [attributes]> ... </Block>
    <Block [attributes]> ... </Block>
  </Table>
</RAID>
</RAIDList>
```

Element `Block`

The element specifies the block number in the RAID layout table (a positive integer number) or an error correction block of the following types:

- `PD` or `ParityOfData`
- `PA` or `ParityOfAll`
- `RS` or `ReedSolomon`
- `U` or `Unknown`
- `I` or `Ignore`

Any other value is treated as `Unknown`.

Attributes:

id	`<string>`	Required	The alpha-numerical identifier of the block in the RAID layout table. The element in the 3-rd column of the 2-nd line is designated as `C2`. `AA` is used after letter `Z`, and so on.
sequence	`<u16>` or `row`	Optional	The identifier of a sequence. The attribute should be specified only for checksum blocks of the sequences described in the `<Sequences>` section. Default: `row`

Section `Sequences`

This section describes the data checksum sequences used to preserve data integrity. It can contain any number of the `<Sequence>` elements.

Section structure example:

```
<RAIDList>
  <RAID name="example" parents="4" rows="4" blocksize="16777216">
    <Table>
      ...
    </Table>
    <Sequences>
      <Sequence [attributes]> ... </Sequence>
      ...
      <Sequence [attributes]> ... </Sequence>
    </Sequences>
  </RAID>
</RAIDList>
```

Element `Sequence`

The element contains the list of the RAID blocks separated by a space which belong to that sequence.

Attributes:

id	`<u16>`	Required	The sequence identifier.

Element example:

See the **RAID configuration file example**.

Section Offsets

This section describes the offsets of each parent object.. It contains the <Offset> elements which number should not exceed the value of the parents attribute of the <RAID> section. If the <Offsets> section is absent, offsets are treated as zero.

Section structure example:

```
<RAIDList>
  <RAID name="example" parents="4" rows="4" blocksize="16777216">
    <Table>
      ...
    </Table>
    <Offsets>
      <Offset [attributes]> ... </Offset>
      <Offset [attributes]> ... </Offset>
      <Offset [attributes]> ... </Offset>
      <Offset [attributes]> ... </Offset>
    </Offsets>
  </RAID>
</RAIDList>
```

Element Offset

The element specifies the offset of a RAID parent in bytes.

Attributes:

id	<u16>	Required	The RAID parent identifier. (from 1 to the parents attribute of the <RAID> section.)

Element example:

```
<RAIDList>
  <RAID name="example" parents="4" rows="4" blocksize="16777216">
    <Table>
      ...
    </Table>
    <Offsets>
      <Offset id="1"> 0x00100</Offset>
      <Offset id="3"> 0x01000</Offset>
    </Offsets>
  </RAID>
</RAIDList>
```

Comments

```
<!-- Comment string -->
```

An XML standard string for a comment.

2.4.11   Description Files for RAID Configurations

Below are description files for RAID examples described in the **Volume Sets and RAIDs** chapter. The syntax of them is described in the **Syntax of a Description File for RAID Configurations** topic.

StripeSet

The stripe set layout is described in the **Volume Sets, Stripe Sets, and Mirrors** topic.

```
<?xml version="1.0" encoding="UTF-8" ?>
<RAIDList>
  <RAID name="StripeSet" parents="2" rows="2" blocksize="16777216">
    <Table>
      <Block id="A1">1</Block>
      <Block id="B1">2</Block>
      <Block id="A2">3</Block>
      <Block id="B2">4</Block>
    </Table>
  </RAID>
</RAIDList>
```

Basic RAID 5

The RAID layout is described in the **Working with Basic RAID 4 and RAID 5 Operations** topic.

```
<?xml version="1.0" encoding="UTF-8" ?>
<RAIDList>
  <RAID name="RAID5Layout" parents="3" rows="3" blocksize="16777216">
    <Table>
      <Block id="A1">1</Block>
      <Block id="B1">2</Block>
      <Block id="C1">XorOfData</Block>
      <Block id="A2">3</Block>
      <Block id="B2">XorOfData</Block>
      <Block id="C2">4</Block>
      <Block id="A3">XorOfData</Block>
      <Block id="B3">5</Block>
      <Block id="C3">6</Block>
    </Table>
  </RAID>
</RAIDList>
```

RAID 5 with parity delays

The RAID layout is described in the **RAID5 with Parity Delays Operations** topic.

```
<?xml version="1.0" encoding="UTF-8" ?>
<RAIDList>
  <RAID blockSize="16384" name="RAID5Delay" parents="3" rows="48">
    <Table>
      <Block id="A1">1</Block>
      <Block id="B1">2</Block>
      <Block id="C1">XorOfData</Block>
      <Block id="A2">3</Block>
      <Block id="B2">4</Block>
      <Block id="C2">XorOfData</Block>
      <Block id="A3">5</Block>
      <Block id="B3">6</Block>
      <Block id="C3">XorOfData</Block>
      <Block id="A4">7</Block>
      <Block id="B4">8</Block>
      <Block id="C4">XorOfData</Block>
      <Block id="A5">9</Block>
      <Block id="B5">10</Block>
      <Block id="C5">XorOfData</Block>
      <Block id="A6">11</Block>
```

```
<Block id="B6">12</Block>
<Block id="C6">XorOfData</Block>
<Block id="A7">13</Block>
<Block id="B7">14</Block>
<Block id="C7">XorOfData</Block>
<Block id="A8">15</Block>
<Block id="B8">16</Block>
<Block id="C8">XorOfData</Block>
<Block id="A9">17</Block>
<Block id="B9">18</Block>
<Block id="C9">XorOfData</Block>
<Block id="A10">19</Block>
<Block id="B10">20</Block>
<Block id="C10">XorOfData</Block>
<Block id="A11">21</Block>
<Block id="B11">22</Block>
<Block id="C11">XorOfData</Block>
<Block id="A12">23</Block>
<Block id="B12">24</Block>
<Block id="C12">XorOfData</Block>
<Block id="A13">25</Block>
<Block id="B13">26</Block>
<Block id="C13">XorOfData</Block>
<Block id="A14">27</Block>
<Block id="B14">28</Block>
<Block id="C14">XorOfData</Block>
<Block id="A15">29</Block>
<Block id="B15">30</Block>
<Block id="C15">XorOfData</Block>
<Block id="A16">31</Block>
<Block id="B16">32</Block>
<Block id="C16">XorOfData</Block>
<Block id="A17">33</Block>
<Block id="B17">XorOfData</Block>
<Block id="C17">34</Block>
<Block id="A18">35</Block>
<Block id="B18">XorOfData</Block>
<Block id="C18">36</Block>
<Block id="A19">37</Block>
<Block id="B19">XorOfData</Block>
<Block id="C19">38</Block>
<Block id="A20">39</Block>
<Block id="B20">XorOfData</Block>
<Block id="C20">40</Block>
<Block id="A21">41</Block>
<Block id="B21">XorOfData</Block>
<Block id="C21">42</Block>
<Block id="A22">43</Block>
<Block id="B22">XorOfData</Block>
<Block id="C22">44</Block>
<Block id="A23">45</Block>
<Block id="B23">XorOfData</Block>
<Block id="C23">46</Block>
```

```
<Block id="A24">47</Block>
<Block id="B24">XorOfData</Block>
<Block id="C24">48</Block>
<Block id="A25">49</Block>
<Block id="B25">XorOfData</Block>
<Block id="C25">50</Block>
<Block id="A26">51</Block>
<Block id="B26">XorOfData</Block>
<Block id="C26">52</Block>
<Block id="A27">53</Block>
<Block id="B27">XorOfData</Block>
<Block id="C27">54</Block>
<Block id="A28">55</Block>
<Block id="B28">XorOfData</Block>
<Block id="C28">56</Block>
<Block id="A29">57</Block>
<Block id="B29">XorOfData</Block>
<Block id="C29">58</Block>
<Block id="A30">59</Block>
<Block id="B30">XorOfData</Block>
<Block id="C30">60</Block>
<Block id="A31">61</Block>
<Block id="B31">XorOfData</Block>
<Block id="C31">62</Block>
<Block id="A32">63</Block>
<Block id="B32">XorOfData</Block>
<Block id="C32">64</Block>
<Block id="A33">XorOfData</Block>
<Block id="B33">65</Block>
<Block id="C33">66</Block>
<Block id="A34">XorOfData</Block>
<Block id="B34">67</Block>
<Block id="C34">68</Block>
<Block id="A35">XorOfData</Block>
<Block id="B35">69</Block>
<Block id="C35">70</Block>
<Block id="A36">XorOfData</Block>
<Block id="B36">71</Block>
<Block id="C36">72</Block>
<Block id="A37">XorOfData</Block>
<Block id="B37">73</Block>
<Block id="C37">74</Block>
<Block id="A38">XorOfData</Block>
<Block id="B38">75</Block>
<Block id="C38">76</Block>
<Block id="A39">XorOfData</Block>
<Block id="B39">77</Block>
<Block id="C39">78</Block>
<Block id="A40">XorOfData</Block>
<Block id="B40">79</Block>
<Block id="C40">80</Block>
<Block id="A41">XorOfData</Block>
<Block id="B41">81</Block>
```

```
      <Block id="C41">82</Block>
      <Block id="A42">XorOfData</Block>
      <Block id="B42">83</Block>
      <Block id="C42">84</Block>
      <Block id="A43">XorOfData</Block>
      <Block id="B43">85</Block>
      <Block id="C43">86</Block>
      <Block id="A44">XorOfData</Block>
      <Block id="B44">87</Block>
      <Block id="C44">88</Block>
      <Block id="A45">XorOfData</Block>
      <Block id="B45">89</Block>
      <Block id="C45">90</Block>
      <Block id="A46">XorOfData</Block>
      <Block id="B46">91</Block>
      <Block id="C46">92</Block>
      <Block id="A47">XorOfData</Block>
      <Block id="B47">93</Block>
      <Block id="C47">94</Block>
      <Block id="A48">XorOfData</Block>
      <Block id="B48">95</Block>
      <Block id="C48">96</Block>
    </Table>
    <Offsets>
      <Offset id="1">557056</Offset>
      <Offset id="2">557056</Offset>
      <Offset id="3">557056</Offset>
    </Offsets>
  </RAID>
</RAIDList>
```

Advanced RAID 5

The RAID layout is described in the **Working with Advanced RAID Layouts** topic.

```
<?xml version="1.0" encoding="UTF-8" ?>
<RAIDList>
  <RAID name="RAID5Complex" parents="3" rows="9" blocksize="16777216">
    <Table>
      <Block id="A1">XorOfData</Block>
      <Block id="B1">1</Block>
      <Block id="C1">2</Block>
      <Block id="A2">XorOfData</Block>
      <Block id="B2">3</Block>
      <Block id="C2">4</Block>
      <Block id="A3">XorOfData</Block>
      <Block id="B3">5</Block>
      <Block id="C3">6</Block>
      <Block id="A4">7</Block>
      <Block id="B4">XorOfData</Block>
      <Block id="C4">8</Block>
      <Block id="A5">10</Block>
      <Block id="B5">XorOfData</Block>
      <Block id="C5">9</Block>
      <Block id="A6">11</Block>
```

```
      <Block id="B6">XorOfData</Block>
      <Block id="C6">12</Block>
      <Block id="A7">13</Block>
      <Block id="B7">14</Block>
      <Block id="C7">XorOfData</Block>
      <Block id="A8">15</Block>
      <Block id="B8">16</Block>
      <Block id="C8">XorOfData</Block>
      <Block id="A9">17</Block>
      <Block id="B9">18</Block>
      <Block id="C9">XorOfData</Block>
    </Table>
    <Offsets>
      <Offset id="1">16777216</Offset>
      <Offset id="2">16777216</Offset>
      <Offset id="3">16777216</Offset>
    </Offsets>
  </RAID>
</RAIDList>
```

Advanced RAID

The RAID layout is described in the **Working with Advanced RAID Layouts** topic.

```
<?xml version="1.0" encoding="UTF-8" ?>
<RAIDList>
  <RAID blockSize="524288" name="RAID5_MAC_Pro" parents="4" rows="3">
    <Table>
      <Block id="A1" sequence="1">XorOfData</Block>
      <Block id="B1">1</Block>
      <Block id="C1">2</Block>
      <Block id="D1" sequence="2">XorOfData</Block>
      <Block id="A2">3</Block>
      <Block id="B2">4</Block>
      <Block id="C2" sequence="3">XorOfData</Block>
      <Block id="D2">5</Block>
      <Block id="A3">6</Block>
      <Block id="B3" sequence="4">XorOfData</Block>
      <Block id="C3">7</Block>
      <Block id="D3">8</Block>
    </Table>
    <Sequences>
      <Sequence id="1">A1 B1 C1</Sequence>
      <Sequence id="2">D1 A2 B2</Sequence>
      <Sequence id="3">C2 D2 A3</Sequence>
      <Sequence id="4">B3 C3 D3</Sequence>
    </Sequences>
    <Offsets>
      <Offset id="1">16777216</Offset>
      <Offset id="2">16777216</Offset>
      <Offset id="3">16777216</Offset>
      <Offset id="4">16777216</Offset>
    </Offsets>
  </RAID>
</RAIDList>
```

RAID 6 Reed-Solomon (Left Synchronous (Standard)) Preset

The RAID layout is described in the **Working with RAID 6 Presets** topic.

```
<?xml version="1.0" encoding="UTF-8" ?>
<RAIDList>
  <RAID name="RAID6RS" parents="5" rows="5" blocksize="16777216">
    <Table>
      <Block id="A1">ReedSolomon</Block>
      <Block id="B1">1</Block>
      <Block id="C1">2</Block>
      <Block id="D1">3</Block>
      <Block id="E1">XorOfData</Block>
      <Block id="A2">4</Block>
      <Block id="B2">5</Block>
      <Block id="C2">6</Block>
      <Block id="D2">XorOfData</Block>
      <Block id="E2">ReedSolomon</Block>
      <Block id="A3">8</Block>
      <Block id="B3">9</Block>
      <Block id="C3">XorOfData</Block>
      <Block id="D3">ReedSolomon</Block>
      <Block id="E3">7</Block>
      <Block id="A4">12</Block>
      <Block id="B4">XorOfData</Block>
      <Block id="C4">ReedSolomon</Block>
      <Block id="D4">10</Block>
      <Block id="E4">11</Block>
      <Block id="A5">XorOfData</Block>
      <Block id="B5">ReedSolomon</Block>
      <Block id="C5">13</Block>
      <Block id="D5">14</Block>
      <Block id="E5">15</Block>
    </Table>
  </RAID>
</RAIDList>
```

Advanced RAID 6

The RAID layout is described in the **Working with Advanced RAID Layouts** topic.

```
<?xml version="1.0" encoding="UTF-8" ?>
<RAIDList>
  <RAID name="RAID6Complex" parents="5" rows="6" blocksize="16777216">
    <Table>
      <Block id="A1">ReedSolomon</Block>
      <Block id="B1">1</Block>
      <Block id="C1">2</Block>
      <Block id="D1">3</Block>
      <Block id="E1">XorOfData</Block>
      <Block id="A2">4</Block>
      <Block id="B2">5</Block>
      <Block id="C2">6</Block>
      <Block id="D2">XorOfData</Block>
      <Block id="E2">ReedSolomon</Block>
      <Block id="A3">8</Block>
```

```
      <Block id="B3">9</Block>
      <Block id="C3">XorOfData</Block>
      <Block id="D3">ReedSolomon</Block>
      <Block id="E3">7</Block>
      <Block id="A4">12</Block>
      <Block id="B4">XorOfData</Block>
      <Block id="C4">ReedSolomon</Block>
      <Block id="D4">10</Block>
      <Block id="E4">11</Block>
      <Block id="A5">XorOfData</Block>
      <Block id="B5">ReedSolomon</Block>
      <Block id="C5">13</Block>
      <Block id="D5">14</Block>
      <Block id="E5">15</Block>
      <Block id="A6" sequence="1">XorOfAll</Block>
      <Block id="B6" sequence="2">XorOfAll</Block>
      <Block id="C6" sequence="3">XorOfAll</Block>
      <Block id="D6" sequence="4">XorOfAll</Block>
      <Block id="E6" sequence="5">XorOfAll</Block>
    </Table>
    <Sequences>
      <Sequence id="1">A1 A2 A3 A4 A5 A6</Sequence>
      <Sequence id="2">B1 B2 B3 B4 B5 B6</Sequence>
      <Sequence id="3">C1 C2 C3 C4 C5 C6</Sequence>
      <Sequence id="4">D1 D2 D3 D4 D5 D6</Sequence>
      <Sequence id="5">E1 E2 E3 E4 E5 E6</Sequence>
    </Sequences>
  </RAID>
</RAIDList>
```

RAID10 (1+0)

The RAID layout is described in the **RAID10 (1+0)** topic.

```
<?xml version="1.0" encoding="UTF-8" ?>
<RAIDList>
  <RAID blockSize="65536" name="RAID10" parents="4" rows="1">
    <Table>
      <Block id="A1">1</Block>
      <Block id="B1">1</Block>
      <Block id="C1">2</Block>
      <Block id="D1">2</Block>
    </Table>
  </RAID>
</RAIDList>
```

RAID1E

The RAID layout is described in the **RAID1E** topic.

```
<?xml version="1.0" encoding="UTF-8" ?>
<RAIDList>
  <RAID blockSize="65536" name="raid1e" parents="3" rows="2">
    <Table>
      <Block id="A1">1</Block>
      <Block id="B1">1</Block>
      <Block id="C1">2</Block>
```

```
      <Block id="A2">2</Block>
      <Block id="B2">3</Block>
      <Block id="C2">3</Block>
    </Table>
  </RAID>
</RAIDList>
```

RAID5E

The RAID layout is described in the **RAID5E** topic.

```
<?xml version="1.0" encoding="UTF-8" ?>
<RAIDList>
  <RAID blockSize="65536" name="RAID5E" parents="4" rows="5">
    <Table>
      <Block id="A1">1</Block>
      <Block id="B1">2</Block>
      <Block id="C1">3</Block>
      <Block id="D1">XorOfData</Block>
      <Block id="A2">5</Block>
      <Block id="B2">6</Block>
      <Block id="C2">XorOfData</Block>
      <Block id="D2">4</Block>
      <Block id="A3">9</Block>
      <Block id="B3">XorOfData</Block>
      <Block id="C3">7</Block>
      <Block id="D3">8</Block>
      <Block id="A4">XorOfData</Block>
      <Block id="B4">10</Block>
      <Block id="C4">11</Block>
      <Block id="D4">12</Block>
      <Block id="A5">Ignore</Block>
      <Block id="B5">Ignore</Block>
      <Block id="C5">Ignore</Block>
      <Block id="D5">Ignore</Block>
    </Table>
  </RAID>
</RAIDList>
```

RAID5EE

The RAID layout is described in the **RAID5EE** topic.

```
<?xml version="1.0" encoding="UTF-8" ?>
<RAIDList>
  <RAID blockSize="65536" name="raid5ee" parents="4" rows="4">
    <Table>
      <Block id="A1">1</Block>
      <Block id="B1">2</Block>
      <Block id="C1">Ignore</Block>
      <Block id="D1">XorOfData</Block>
      <Block id="A2">4</Block>
      <Block id="B2">Ignore</Block>
      <Block id="C2">XorOfData</Block>
      <Block id="D2">3</Block>
      <Block id="A3">Ignore</Block>
      <Block id="B3">XorOfData</Block>
```

```
      <Block id="C3">5</Block>
      <Block id="D3">6</Block>
      <Block id="A4">XorOfData</Block>
      <Block id="B4">7</Block>
      <Block id="C4">8</Block>
      <Block id="D4">Ignore</Block>
    </Table>
  </RAID>
</RAIDList>
```

RAID6E

The RAID layout is described in the **RAID6E** topic.

```
<?xml version="1.0" encoding="UTF-8" ?>
<RAIDList>
  <RAID blockSize="65536" name="raid6e" parents="6" rows="7">
    <Table>
      <Block id="A1">ReedSolomon</Block>
      <Block id="B1">1</Block>
      <Block id="C1">2</Block>
      <Block id="D1">3</Block>
      <Block id="E1">4</Block>
      <Block id="F1">XorOfData</Block>
      <Block id="A2">5</Block>
      <Block id="B2">6</Block>
      <Block id="C2">7</Block>
      <Block id="D2">8</Block>
      <Block id="E2">XorOfData</Block>
      <Block id="F2">ReedSolomon</Block>
      <Block id="A3">10</Block>
      <Block id="B3">11</Block>
      <Block id="C3">12</Block>
      <Block id="D3">XorOfData</Block>
      <Block id="E3">ReedSolomon</Block>
      <Block id="F3">9</Block>
      <Block id="A4">15</Block>
      <Block id="B4">16</Block>
      <Block id="C4">XorOfData</Block>
      <Block id="D4">ReedSolomon</Block>
      <Block id="E4">13</Block>
      <Block id="F4">14</Block>
      <Block id="A5">20</Block>
      <Block id="B5">XorOfData</Block>
      <Block id="C5">ReedSolomon</Block>
      <Block id="D5">17</Block>
      <Block id="E5">18</Block>
      <Block id="F5">19</Block>
      <Block id="A6">XorOfData</Block>
      <Block id="B6">ReedSolomon</Block>
      <Block id="C6">21</Block>
      <Block id="D6">22</Block>
      <Block id="E6">23</Block>
      <Block id="F6">24</Block>
      <Block id="A7">Ignore</Block>
```

```
      <Block id="B7">Ignore</Block>
      <Block id="C7">Ignore</Block>
      <Block id="D7">Ignore</Block>
      <Block id="E7">Ignore</Block>
      <Block id="F7">Ignore</Block>
    </Table>
  </RAID>
</RAIDList>
```

RAID6 (Double Xor)

The RAID layout is described in the **Working with RAID6 (Double Xor) Presets** topic.

```xml
<?xml version="1.0" encoding="UTF-8" ?>
<RAIDList>
  <RAID blockSize="65536" name="RAID62X" parents="6" rows="4">
    <Table>
      <Block id="A1">1</Block>
      <Block id="B1">2</Block>
      <Block id="C1">3</Block>
      <Block id="D1">4</Block>
      <Block id="E1">XorOfData</Block>
      <Block id="F1" sequence="1">XorOfData</Block>
      <Block id="A2">5</Block>
      <Block id="B2">6</Block>
      <Block id="C2">7</Block>
      <Block id="D2">8</Block>
      <Block id="E2">XorOfData</Block>
      <Block id="F2" sequence="2">XorOfData</Block>
      <Block id="A3">9</Block>
      <Block id="B3">10</Block>
      <Block id="C3">11</Block>
      <Block id="D3">12</Block>
      <Block id="E3">XorOfData</Block>
      <Block id="F3" sequence="3">XorOfData</Block>
      <Block id="A4">13</Block>
      <Block id="B4">14</Block>
      <Block id="C4">15</Block>
      <Block id="D4">16</Block>
      <Block id="E4">XorOfData</Block>
      <Block id="F4" sequence="4">XorOfData</Block>
    </Table>
    <Sequences>
      <Sequence id="1">A1 F1 D2 C3 D3 B4 C4</Sequence>
      <Sequence id="2">B1 A2 D2 F2 C3 B4 D4</Sequence>
      <Sequence id="3">C1 B2 D2 A3 C3 F3 B4</Sequence>
      <Sequence id="4">D1 C2 D2 B3 C3 A4 B4 F4</Sequence>
    </Sequences>
  </RAID>
</RAIDList>
```

2.5   Data Recovery over Network

This chapter explains how to perform data recovery operations over network.

R-Studio has network capabilities that allow the system administrator, using its computer, to recover files on any

computers accessible over network.

R-Studio supports the TCP/IP protocol and any protocol supported in Microsoft Network.

R-Studio Agent must be installed on computers where files are to be recovered. This program gives **R-Studio** access to local disks on remote computers over network.

If, due to file system crash, the network computer where you are going to recover your data cannot start, you may use **R-Studio Agent Emergency** to start the computer.

Files can be recovered without *R-Studio Agent* if the computer where the files are to be recovered runs Windows NT/2000/XP/2003/Vista/2008/7 is accessible from a computer also running Windows NT/2000/XP/2003/Vista/2008/7. In this case, the administrator must have administrator privileges on the remote computer.

You should always disable a firewall and/or antivirus software on the both computers. As an alternative, advanced users may tune them to allow **R-Studio** and *R-Studio Agent* to communicate via network.

All data transmitted over network are encrypted with a strong algorithm for data security. Restoring data over network is very much the same as that on a local computer.

In addition, **R-Studio** can load/save any files like disk images, scan info files, RAID configuration files, from/to the computers to which it has access using *R-Studio Agent*.

- **R-Studio Agent**
- **Data Recovery over Network**
- **Connecting over the Internet**

2.5.1   R-Studio Agent

R-Studio Agent is a program that provides **R-Studio** with an access to the drives of a network computer. It should be installed and properly registered on the computer which drives are to be accessed. *R-Studio Agent* has versions for the following PC operating systems:

- **Windows**
- **Mac OS**
- **Linux**

and there is **R-Studio Agent Emergency** that can be used to start a computer from which you are going to recover data that cannot start other way due to a file system crash, for example. **R-Studio** can work equally with all versions of *R-Studio Agent* and access computers run under Windows, Mac OS, and Linux.

You must have enough rights on the remote computer to install and run *R-Studio Agent*.

2.5.1.1   R-Studio Agent for Windows

Attention Windows NT/2000/XP/2003/Vista/2008/7 users: R-Studio Agent **should be installed under an administrator account.**

When installed, *R-Studio Agent* starts automatically and runs as a service. To configure it, *R-Studio Agent* should be started again manually.

▣ *The following switches are available:*

`-?`	evokes a help screen;
`-install`	installs *R-Studio Agent* as a service
`-remove`	removes *R-Studio Agent* services

`-console`	starts **_R-Studio Agent_** as a console application

Started without a switch, **_R-Studio Agent_** runs as a GUI application and its icon appears on the taskbar tray. In this mode, it can be configured and its log may be viewed.

Simply connect to the remote computer providing a desired password for **_R-Studio Agent_** in the `Connect to Remote Computer` dialog box. **R-Studio** checks if there is **_R-Studio Agent_** running on this computer. If not, a `Can't connect...` message will appear.

Click the **Yes** button, and **R-Studio** will remotely install **_R-Studio Agent_**.

Attention Windows NT/2000/XP/2003/Vista/2008/7 users: R-Studio Agent **may be remotely installed over a network from a computer running Windows NT/2000/XP/2003/Vista/2008/7 to another computer running Windows NT/2000/XP/2003/Vista/2008/7. To do so, you must have administrator accounts on both computers.**

To access the R-Studio Agent **main panel,**

1   Click its tray icon

>   The main panel will appear. You may view its log
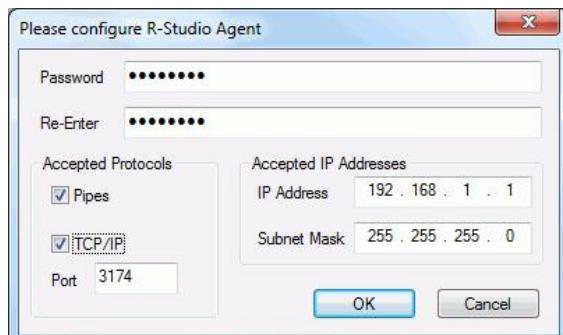
R-Studio Agent **main panel**

To configure _R-Studio Agent_,

1   Right-click its tray icon and select Configure

2   Specify required parameters on the Please configure R-Studio Agent **dialog box and click the OK button**

Please configure R-Studio Agent **dialog box**

□ R-Studio Agent Options

Password:	Enter a password to obtain access to this computer from a network.
Re-Enter:	Re-enter the password.
Accepted Protocols	
Pipes	supported by Windows NT/2000/XP/2003/Vista/2008/7 only. To improve security, this option should be disabled.
TCP/IP	supported by any network OS.
Port	port for incoming connections
Accepted IP Addresses	
IP Address	specifies addresses from which this computer can be accessed.
Subnet Mask	specifies a subnet mask of the network from which this computer can be accessed.

> *R-Studio Agent* **will now run with the specified parameters**

2.5.1.2   R-Studio Agent for Mac

You need to have an administrative account on the Mac computer to start **R-Studio Agent for Mac**.

To start the R-Studio Agent for Mac and access its **main panel,**

1   **Go to the Application folder, double-click R-Studio Agent for Mac, and enter the account password**

> **The main panel will appear. You may view its log**

R-Studio Agent for Mac **main panel**

To configure *R-Studio Agent for Mac*,

1   **Go to the R-Studio Agent for Mac menu and select Preferences**

2 **Specify required parameters on the** Please configure R-Studio Agent **dialog box and click the OK button**

Please configure R-Studio Agent Mac **dialog box**

☐ R-Studio Agent for Mac Options

Password:	Enter a password to obtain access to this computer from a network.
Re-Enter:	Re-enter the password.
Incoming connection preferences	
Enable incoming connections	Select this checkbox if you want to allow incoming connections.
TCP/IP Port	A TCP/IP port for incoming connections
Accepted IP Addresses	
IP Address	specifies addresses from which this computer can be accessed.
Subnet Mask	specifies a subnet mask of the network from which this computer can be accessed.

> *R-Studio Agent for Mac* **will now run with the specified parameters**

Connecting from R-Studio Agent for Mac to R-Studio.

To establish a connection from R-Studio Agent for Mac to R-Studio,

1 **Run the R-Studio Agent for Mac and select Connect from the Tools menu**

2 **Enter the necessary information on the** Connect to R-Studio **dialog box and click the Connect button.**

Connect to R-Studio **dialog box**

⊟ **Connect to R-Studio settings**

Server	Specify the DNS name or IP address of the host where **R-Studio** is running.
Port	Specify the port set on the **R-Studio** Connect to Remote Computer dialog box.
Password	Specify the password set on the **R-Studio** Connect to Remote Computer dialog box.

> **R-Studio Agent for Mac** will connect to the computer where **R-Studio** is running and it will show the hard drive and logical disk structure of the remote computer.

It can be processed the same way as that on a local computer.

2.5.1.3   R-Studio Agent for Linux

You need to have the root privileges to run **R-Studio Agent for Linux.**

Unlike **R-Studio Agent for Windows** and **R-Studio Agent for Mac**, **R-Studio Agent for Linux** is a console application and should be run in the Terminal. You also need to mark it as an executable before start.

When it is started for the first time, **R-Studio Agent for Linux** asks for its configuration.

R-Studio Agent for Linux Configuration **dialog box**

```
 File  Edit  View  Terminal  Help
root@BCK-Ubuntu:~# cd RSA
root@BCK-Ubuntu:~/RSA# ./rsagent
Configuring R-Studio Agent 6.0.1020
# Specify password for incoming connections >
# Confirm password for incoming connections >
# Specify IP Address (and optional NETMASK delimeted by space) to limit incoming
  connections or 0 to allow any [] >192.168.1.1 255.255.255.0
# Specify TCP/IP port for listening [3174] >
* Running R-Studio Agent
* This product is licensed to: UNREGISTERED DEMO VERSION
# System: 2 x Intel(R) Core(TM)2 CPU 6300 @ 1.86GHz, 1862 MHz, 993 MB RAM
# OS: Linux 2.6.32-41-generic-pae #91-Ubuntu SMP Wed Jun 13 12:00:09 UTC 2012
? R-Studio Agent is not yet registered, 64KB file size recovery limit is implied
 until remotely registered
* R-Studio Agent started and ready to accept connections...
* You may press ENTER to start connection to remote R-Studio ...█
```

▭ **R-Studio Agent for Linux Options**

Specify password for incoming connection	Enter a password to obtain access to this computer from a network.
Confirm password for incoming connection	Re-enter the password for confirmation.
Specify IP address...	Specifies addresses and a subnet mask from which this computer can be accessed. Enter 0 to allow connections from any address.
Specify TCP/IP Port for listening	A TCP/IP port for incoming connections. Press Enter for the default one [3174].

Don't pay much attention to the warning about "unregistered demo version". If necessary, you'll be able to register **R-Studio Agent for Linux** through **R-Studio**.

You may see the current configuration by starting **R-Studio Agent for Linux** with the command `rsagent --show_config`.

R-Studio Agent for Linux Configuration **dialog box**

```
 File  Edit  View  Terminal  Help
root@BCK-Ubuntu:~# cd RSA
root@BCK-Ubuntu:~/RSA# ./rsagent --show_config
R-Studio Agent 6.0.1020
Password for incoming connection: present
Accept incoming connection from IP addresses / NetMask: 192.168.1.1 / 255.255.25
5.0
Listening on port: 3174
root@BCK-Ubuntu:~/RSA# █
```

You may change the current configuration by starting **R-Studio Agent for Linux** with the command `rsagent --configure`.
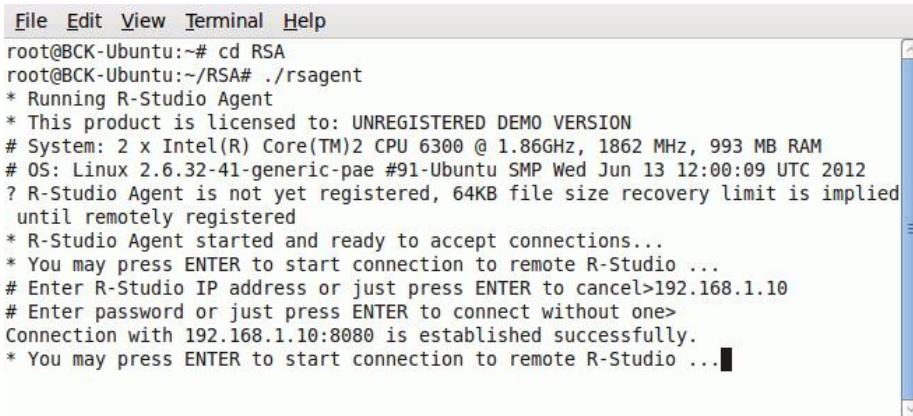
Connecting from R-Studio Agent for Linux to R-Studio.

To establish a connection from R-Studio Agent for Linux to R-Studio,

1 **Run the R-Studio Agent for Linux and press Enter**

2 **Enter the necessary information**

Connect to R-Studio **dialog box**

```
File  Edit  View  Terminal  Help
root@BCK-Ubuntu:~# cd RSA
root@BCK-Ubuntu:~/RSA# ./rsagent
* Running R-Studio Agent
* This product is licensed to: UNREGISTERED DEMO VERSION
# System: 2 x Intel(R) Core(TM)2 CPU 6300 @ 1.86GHz, 1862 MHz, 993 MB RAM
# OS: Linux 2.6.32-41-generic-pae #91-Ubuntu SMP Wed Jun 13 12:00:09 UTC 2012
? R-Studio Agent is not yet registered, 64KB file size recovery limit is implied
  until remotely registered
* R-Studio Agent started and ready to accept connections...
* You may press ENTER to start connection to remote R-Studio ...
# Enter R-Studio IP address or just press ENTER to cancel>192.168.1.10
# Enter password or just press ENTER to connect without one>
Connection with 192.168.1.10:8080 is established successfully.
* You may press ENTER to start connection to remote R-Studio ...█
```

> **R-Studio Agent for Linux will connect to the computer where R-Studio is running and it will show the hard drive and logical disk structure of the remote computer.**
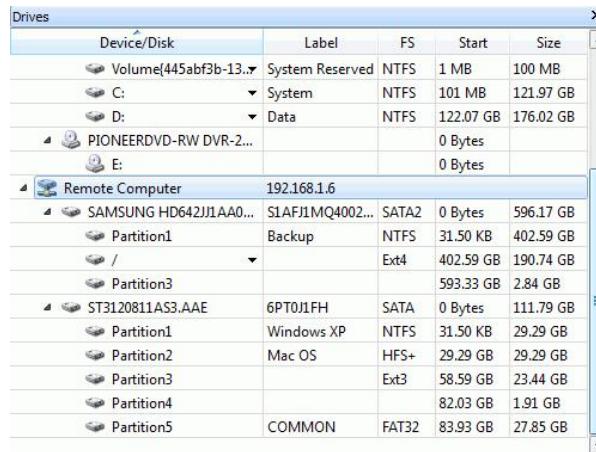
Drives					
Device/Disk	Label	FS	Start	Size	
💾 Volume{445abf3b-13... ▼	System Reserved	NTFS	1 MB	100 MB	
💾 C: ▼	System	NTFS	101 MB	121.97 GB	
💾 D: ▼	Data	NTFS	122.07 GB	176.02 GB	
▲ 💿 PIONEERDVD-RW DVR-2...			0 Bytes		
💿 E:			0 Bytes		
▲ 🖥 Remote Computer	192.168.1.6				
▲ 💾 SAMSUNG HD642JJ1AA0...	S1AFJ1MQ4002...	SATA2	0 Bytes	596.17 GB	
💾 Partition1	Backup	NTFS	31.50 KB	402.59 GB	
💾 / ▼		Ext4	402.59 GB	190.74 GB	
💾 Partition3			593.33 GB	2.84 GB	
▲ 💾 ST3120811AS3.AAE	6PT0J1FH	SATA	0 Bytes	111.79 GB	
💾 Partition1	Windows XP	NTFS	31.50 KB	29.29 GB	
💾 Partition2	Mac OS	HFS+	29.29 GB	29.29 GB	
💾 Partition3		Ext3	58.59 GB	23.44 GB	
💾 Partition4			82.03 GB	1.91 GB	
💾 Partition5	COMMON	FAT32	83.93 GB	27.85 GB	

It can be processed the same way as that on a local computer.

2.5.2 Data Recovery over Network

Generally, data restoring over network is very much the same as that on a local computer.

R-Studio Agent should be running on the network computer where data are to be recovered.

Read the **Connecting over the Internet** topic to learn how to establish connection between **R-Studio** and **R-Studio Agent** over the Internet.

To connect to a remote computer

1 **Click the Connect to Remote button or select Connect To Remote on the Drive menu and select Connect to the remote computer**

A list of nearby computers will appear in the Computer List on the Connect to Remote Computer dialog box.

Connect to Remote Computer **dialog box**
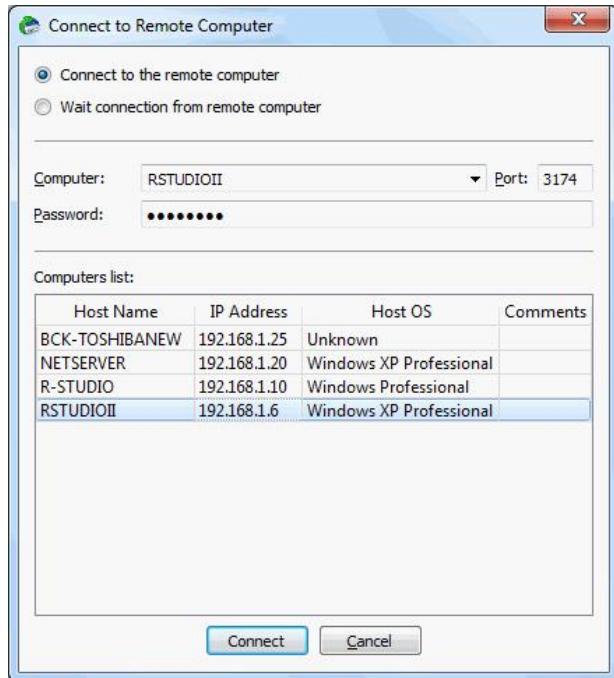
2   Select a computer from the list on the Connect to Remote Computer **dialog box and enter the password**

Otherwise, you need to specify in the Computer: field the name or IP address of the remote computer where data are to be recovered. The Port should coincide with the port specified for the **R-Studio Agent**.

The Password: field is for the password of *R-Studio Agent* running on the remote computer.
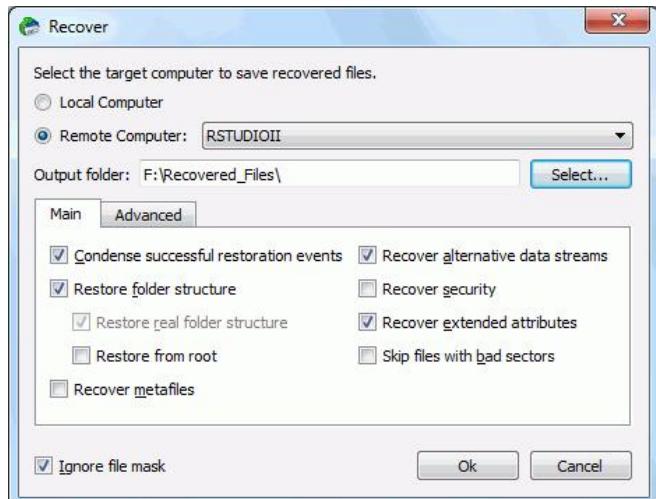
Note: If the remote computer is started with **R-Studio Agent Emergency**, leave this field blank.

>   R-Studio will connect to the remote computer and show its hard drive and logical disk structure of the remote computer below the device/disk structure of your local computer

It can be processed the same way as that on a local computer.

Recover **dialog box**

When the Recover dialog box appears, you may select whether you want to save recovered files on the local or remote computer. Saving recovered files on a remote computer may be useful when the remote computer has a healthy disk because you do not have to transfer files over network. It may be an external USB hard drive, for example.

When **R-Studio** connects to the remote computer, it check if *R-Studio Agent* is present and its password. If there is no *R-Studio Agent* installed, **R-Studio** may try to remotely install it. See the **R-Studio Agent** topic for details.

2.5.3 Connecting over the Internet

R-Studio and **R-Studio Agent** can be connected over the Internet. The connection can be made either using IP addresses or DNS names.

If hosts where **R-Studio** and **R-Studio Agent** are running have public IP addresses the connection can be made the same way as for the local network, except that the IP address or DNS name should be explicitly specified in the Computer filed the Connect to Remote Computer dialog box

If either (or both) of the hosts are on private networks behind NATs and firewalls and do not have public IP addresses, the corresponding ports should be opened or forwarded. In addition, connection should be made either only from **R-Studio** or from **R-Studio Agent**.

Connection directions

* Both R-Studio and R-Studio Agent have public IP addresses (no NAT/firewall) or the ports on the NAT/ firewall are forwarded/opened.
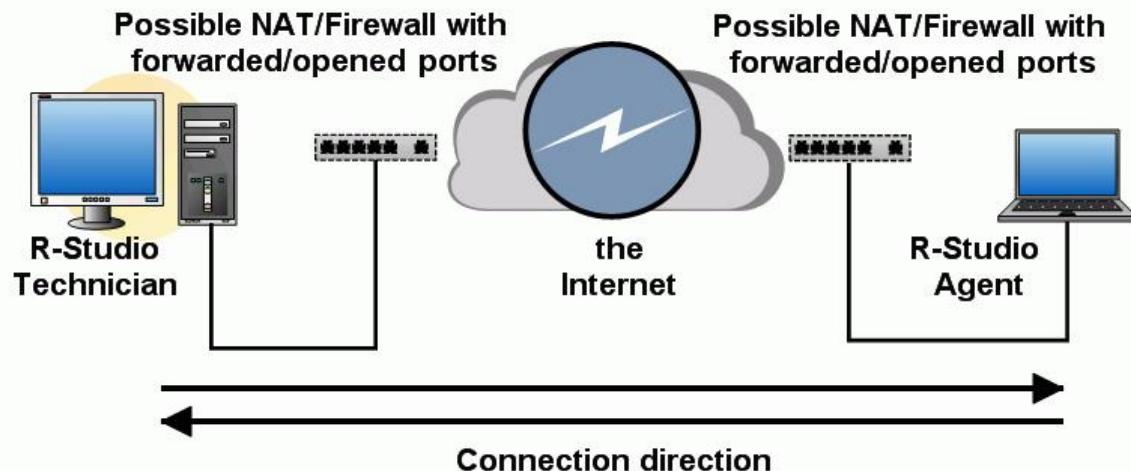
A connection can be made either from **R-Studio** or from **R-Studio Agent**.

* R-Studio is behind a NAT and R-Studio Agent has a public IP address or the ports on its NAT/firewall are forwarded/opened.
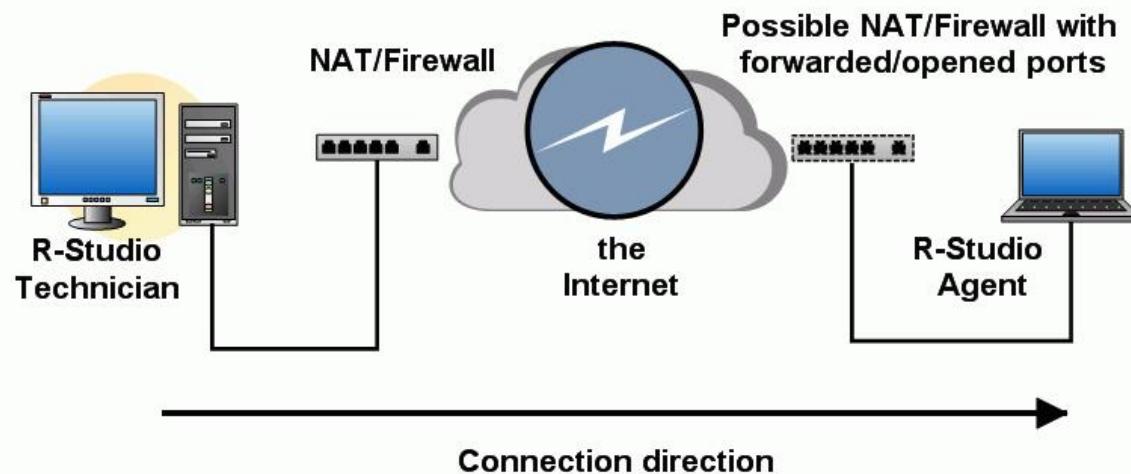
A connection should be made from **R-Studio**.

* R-Studio has a public IP address or the ports on its NAT/firewall are forwarded/opened and R-Studio Agent is behind a NAT.
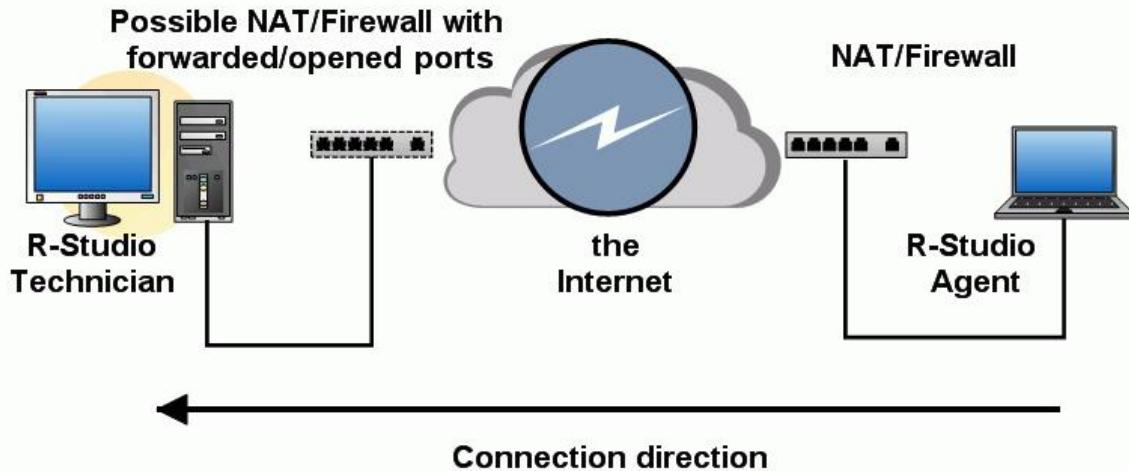
A connection should be made from **R-Studio Agent**.

* Both R-Studio and R-Studio Agent are behind NATs/firewalls.
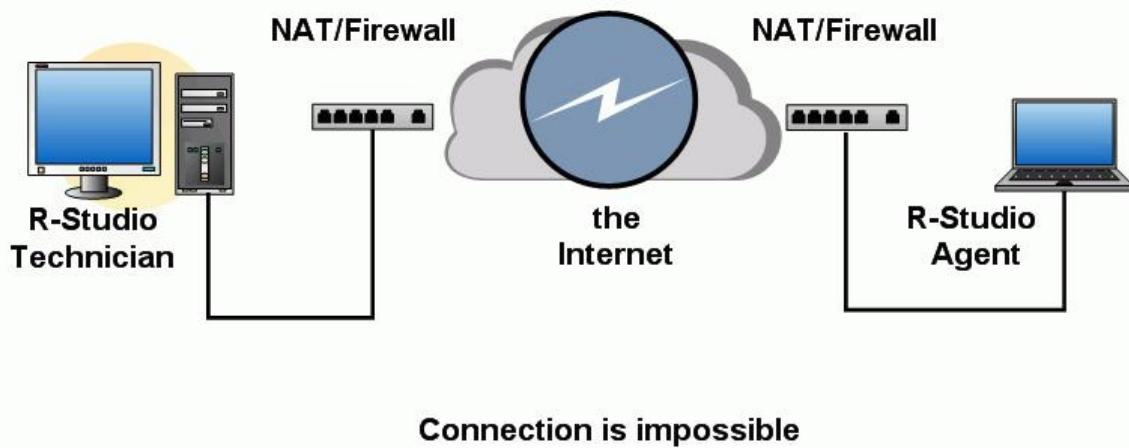
No connections are possible.

Connection from R-Studio Agent to R-Studio

R-Studio settings

If a connection is to be made from **R-Studio Agent** to **R-Studio**, **R-Studio** should be set to accept connection on the Connect to Remote Computer dialog box.

Connect to Remote Computer **dialog box**
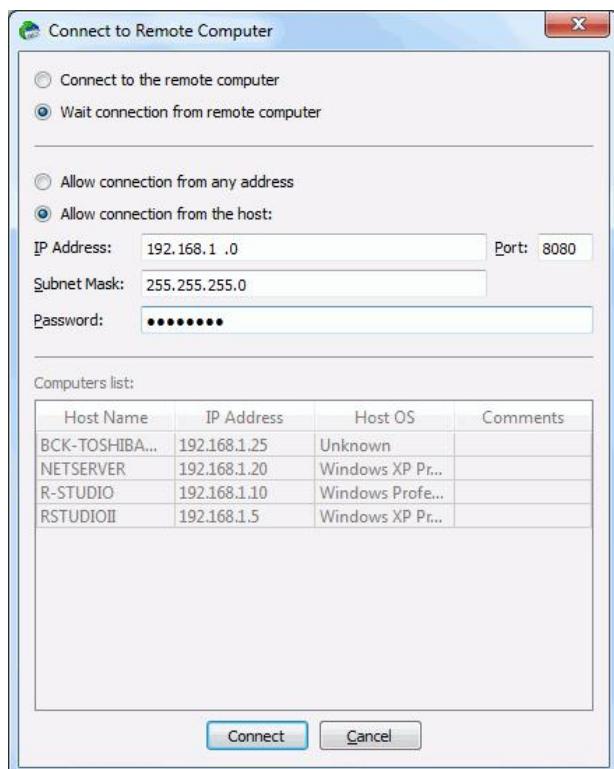
Select **Wait connection from remote computer**, and specify options for incoming connections.

▣ R-Studio Incoming Connection Options

Password:	Enter a password to obtain access to this computer from a network.
Allow connection from any address	Select this option if you want to allow connections to **R-Studio** from any IP address
Allow connection from the host	Select this option if you want to allow connections to **R-Studio** from a specific IP address or a network
IP Address	specifies addresses from which this computer can be accessed.
Subnet Mask	specifies subnet mask of the network from which this computer can be accessed.
Port	port for incoming connections.

R-Studio will wait for an incoming connection.

Waiting for remote connection **dialog box**
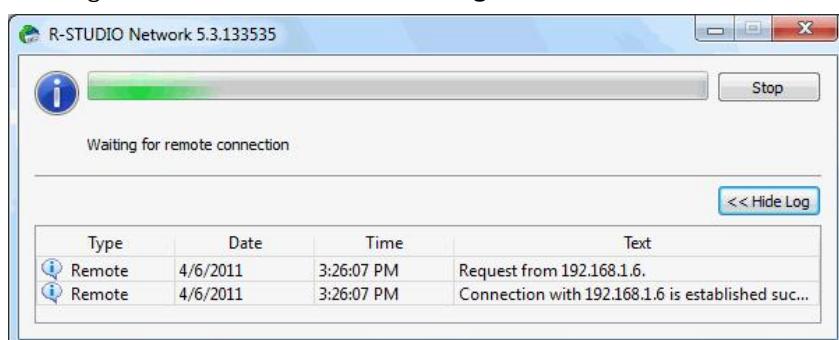
Connecting from R-Studio Agent to R-Studio.

To establish a connection from R-Studio Agent to R-Studio,

(See the **R-Studio Agent for Mac** or **R-Studio Agent for Linux** help page to learn how to establish connections from those **R-Studio Agent** versions).

1   Right-click the R-Studio Agent tray icon and select Connect

2   Enter the necessary information on the Connect to R-Studio **dialog box and click the Connect button.**

Connect to R-Studio **dialog box**
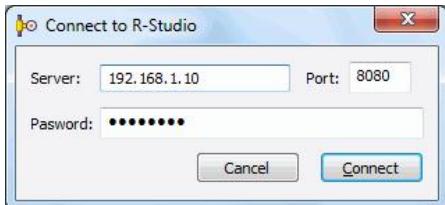
☐ **Connect to R-Studio settings**

Server	Specify the DNS name or IP address of the host where **R-Studio** is running.
Port	Specify the port set on the **R-Studio** Connect to Remote Computer dialog box.
Password	Specify the password set on the **R-Studio** Connect to Remote Computer dialog box.

> **R-Studio Agent will connect to the computer where R-Studio is running and it will show the hard drive and logical disk structure of the remote computer.**
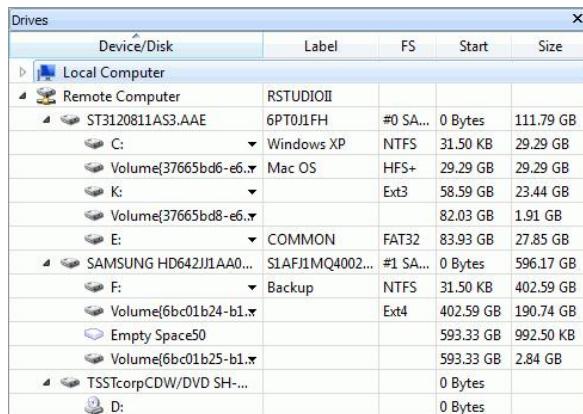
It can be processed the same way as that on a local computer.

III   Text/hexadecimal Editor

Any object visible to **R-Studio** can be viewed and edited in the **Text/hexadecimal editor**. It is also able to parse the data and represent data according to various data patterns. You may also create your own patterns to parse data.

You may turn numerical indexes for objects to distinguish them better.

- **Viewing and Editing Objects**

3.1   Viewing and Editing Objects

YOU MUST BE ABSOLUTELY SURE OF WHAT AND WHERE YOU ARE WRITING!
Or you may completely lose all your data.

Before you can physically write anything on a disk, you need to enable writing.

To enable writing,

1 On the R-**Studio** main panel, select the Tools menu, then Settings, and select Enable Write on the Settings **dialog box.**

> **The** Editable: **status will change to** Yes **from** Read Only**.**

Now the object can be edited.

Locking and unlocking objects

It is possible to manually lock an object being edited in **Text/hexadecimal Editor**.

When an object is locked, **Text/hexadecimal Editor** has an exclusive access to it, and no other programs or Windows can make any changes on it. **Text/hexadecimal Editor** itself always locks the object itself before writing anything on the disk and then unlocks it. But sometimes locking/unlocking may take quite a lot of time, up to several seconds. That is why sometimes it is a good practice to lock an object while editing it in **Text/ hexadecimal Editor**. This can be done by selecting **Lock** on the **Tools** menu.

When considering locking an object in **Text/hexadecimal Editor**, keep in mind the following:

- Starting from Windows 7, it is impossible to change data if it resides on a logical disk without locking the disk. If the data is on a place outside of any logical disk (on an unmounted partition or empty space), such lock is not necessary. Windows Vista, XP, or below do not have such restrictions.
- The **Lock** command tries to lock all logical disks on which the object being edited is placed. For a hard drive, those are all its logical disks, for a file that is a logical disk where it resides. And if a RAID is created from logical disks and a file is opened on that RAID, **Text/hexadecimal Editor** blocks all logical disks on which the file resides.

Moreover:

- If a logical disk is opened in **Text/hexadecimal Editor**, the **Lock** command locks the disk if there is no files

opened by some other programs.

- If a hard drive is opened in **Text/hexadecimal Editor**, the **Lock** command locks the drive if all its logical disks can be locked. That may cause problems is one of the logical disks is a system one.
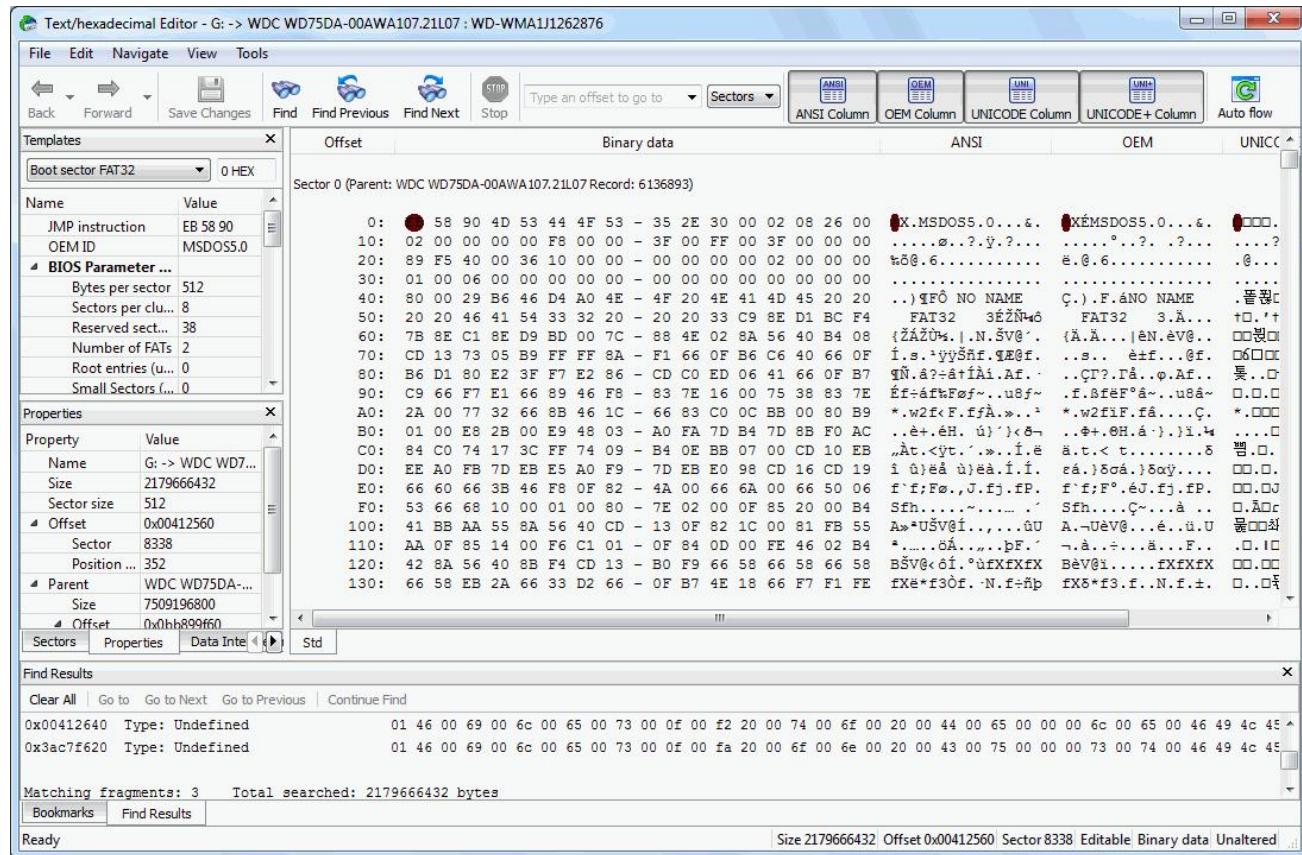
To view/edit an object,

1 **Right-click the object and select View/Edit on the shortcut menu**

⊟ *Other ways to view/edit the object*

- Select the object and select **View/Edit** on the **File** menu

or

- Select the object and press the **Ctrl+E** keys

> **A Text/hexadecimal Editor panel will appear**

⊟ *R-Studio Text/hexadecimal editor*

Data Parsed According to the Selected Pattern

Name	Value
JMP instruction	EB 58 90
OEM ID	MSDOS5.0
⊿ **BIOS Parameter Block**	
Bytes per sector	512
Sectors per cluster	8
Reserved sectors	38
Number of FATs	2
Root entries (unused)	0
Small Sectors (on small volumes)	0
Media descriptor (hex)	F8
Sectors per FAT (small vol.)	0
Sectors per track	63
Number of Heads	255
Hidden sectors	63
Large Sectors (on large volumes)	4257161
⊿ **FAT32 Section**	
Sectors per FAT	4150
Extended Flags	0
File System Version	0
Root Cluster Number	2
File System Information Sector Number	1
Backup Boot Sector	6
Reserved	00 00 00 00 00 00 00 00 00...
⊿ **Extended BIOS Parameter Block**	
BIOS drive (hex, HD=8x)	80
Reserved (must be zero)	0
Ext. boot signature (29h)	29
Volume serial number (decimal)	2698266294
Volume serial number (hex)	B6 46 D4 A0
Volume label	NO NAME
File System ID	FAT32

Object Properties

Property	Value
Name	G: -> WDC WD75DA-00AWA107.21L07 : WD-WMA1J1262876
Size	2179666432
Sector size	512
⊿ Offset	0x00412560
Sector	8338
Position in sector	352
⊿ Parent	WDC WD75DA-00AWA107.21L07
Size	7509196800
⊿ Offset	0x0bb899f60
Sector	6145231

Object Sector Mapping

Sector	Parent Sector
0	6136893
1	6136894
2	6136895
3	6136896
4	6136897
5	6136898
6	6136899
7	6136900
8	6136901
9	6136902

Data Shown as Various Digits

Name	Value
8 bit binary	00000001
ANSI character	r
OEM character	r
⊿ **Little Endian**	
UTF8 character	r
UTF16 character	蔰
8 bit hexadecimal number	0x1
8 bit octal number	01
8 bit unsigned decimal number	1
8 bit signed decimal number	1
16 bit hexadecimal number	0x4601
16 bit octal number	043001
16 bit unsigned decimal number	17921
16 bit signed decimal number	17921
32 bit hexadecimal number	0x69004601
32 bit octal number	015100043001
32 bit unsigned decimal number	1761625601
32 bit signed decimal number	1761625601
64 bit hexadecimal number	0x65006c0069004601
64 bit octal number	0624003300015100043001
64 bit unsigned decimal number	7277935746848146945
64 bit signed decimal number	7277935746848146945
Windows time	24663-11-11 17:51:24
DOS time	1601-01-01 00:00:00
Unix time	2025-10-28 04:26:41
⊿ **Big Endian**	
UTF8 character	r
UTF16 character	ŋ
8 bit hexadecimal number	0x1
8 bit octal number	01
8 bit unsigned decimal number	1

Binary view

Text view

Find Results

Find Results		×
Clear All	Go to Go to Next Go to Previous	Continue Find

0x00412640 Type: Undefined   01 46 00 69 00 6c 00 65 00 73 00 0f 00 f2 20 00 74 00 6f 00 20 00 44 00 65 00 00 00 6c 00 65 00 46 49 4c 45 ▲

0x3ac7f620 Type: Undefined   01 46 00 69 00 6c 00 65 00 73 00 0f 00 fa 20 00 6f 00 6e 00 20 00 43 00 75 00 00 00 73 00 74 00 46 49 4c 45

Matching fragments: 3   Total searched: 2179666432 bytes

List of Bookmarks

Bookmarks			
Bookmark	Location	Offset	Sector
Bookmark 1	Std	0x00000000	0
Bookmark 2	Std	0x00000c00	6
Bookmark 3	Std	0x0c05b4b4	393946
Bookmark 4	Std	0x3902474c	1868067

Viewer/Editor status

Ready	Size 2179666432 Offset 0x00412560 Sector 8338 Editable Binary data Unaltered

Previous Pattern
Click this button to go to the previous pattern.

Next Pattern
Click this button to go to the next pattern.

Save Changes
Click this button to save changes.

ANSI Column	OEM Column	UNICODE Column	UNICODE+ Column	**Code pages**
				Turns supported code pages on/off.

Autoflow
Click this button to turn autoflow on.

Auto flow

Panel view options

You may set which panels and bars to enable/disable.

▤ *To enable/disable:*

ANSI data	Select/clear **ANSI** on the **View** menu
OEM data	Select/clear **OEMr** on the **View** menu
UNICODE data	Select/clear **UNICODE** on the **View** menu
UNICODE+ data	Select/clear **UNICODE+** on the **View** menu
Toolbar	Select/clear **Toolbar** on the **View** menu
Properties View	Select/clear **Properties View** on the **View** menu
Sectors View	Select/clear **Sectors View** on the **View** menu
Data Interpreter View	Select/clear **Data Interpreter View** on the **View** menu
Template View	Select/clear **Template View** on the **View** menu
Bookmarks View	Select/clear **Bookmarks View** on the **View** menu
Find Results View	Select/clear **Find Results View** on the **View** menu

2   View the information and make necessary changes

Select **Save Changes** on the **Tools** menu if you want to save changes.

⊟ *Other ways to save changes*

• Select **Save Changes** on the **File** menu

or

• Press the **Ctrl+S** keys

Viewing

There are up to four tabs showing the data in different representations. Actual number of tabs depends on the object and property being viewed/edited.

Std	Exact attribute data. If the attribute is compressed, **R-Studio** decompresses it prior to showing.
Unlimited	Exact attribute data + free space of last cluster. If the attribute is compressed, **R-Studio** decompresses it prior to showing.
Direct	Actual data written on the disk. If the attribute is not compressed, it coincides with the Std representation.
Allocation	Resident part of the attribute.

You may view data in 4 various code pages: ANSI/OEM/UNICODE/UNICODE+ by switching on/off the respective code pages in the **Code pages** buttons or select the appropriate code pages on the **View** menu.

Patterns or Templates

You may select a pattern according to which the data will be parsed and shown in the parsed data pane. The Data Interpreter shows the data selected on the Template pane in various representations.

You may find the next or previous data that matches the pattern signature on the disk. Right-click the right pane of the editor and select either **Find Template Signature Next** or **Find Template Signature Previous** on the shortcut menu. You may also select these items on the **Edit** menu.

You may also create your own patterns to parse data from various objects.

Searching

To search for a particular string, click the **Find**, **Find Next**, or **Find Previous** buttons or the same items on the **Edit** menu, and specify the string on the Search dialog box.

Search **dialog box**
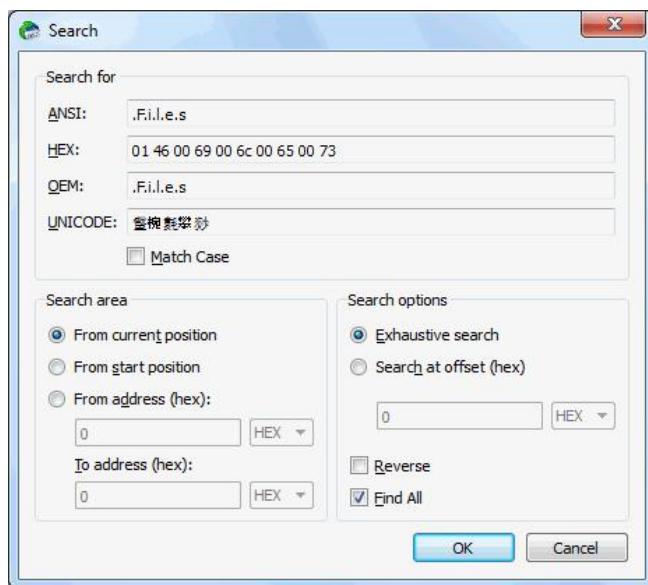
▣ *Search options*

Search for	
HEX	Field for the string to search for in the hexadecimal representation
ANSI	Field for the string to search for in the ANSI encoding
OEM	Field for the string to search for in the OEM encoding
UNICODE	Field for the string to search for in the UNICODE encoding
Match case	Select this check box to make the search case-sensitive
Search area	
From current position	Select this check box to start search from the current position
From start position	Select this check box to start search from the beginning of the object
From Address	Select this check box and specify the range in which the search is to be carried out
Search position	
Exhaustive search	Select this check box to search the entire object
Search at offset	Select this check box and specify the sector offset from which the search will start
Reverse	Select this check box to start the search in the reverse direction
Find all	Select this check box to search for all instances of the string to search. Search results will be shown in the Find Results pane.

Search results are shown on the Find Results pane. You may easily move to the required found item by clicking the item.

Navigating

You may quickly move to a particular part of the object. To move to a particular part of the object being viewed/edited, enter the required offset in the Go to Offset field between the buttons.

Bookmarking

You may create bookmarks to easily move to those places. Right-click the cursor on the place you want to bookmark and select **Toggle Bookmark** on the shortcut menu. The list of bookmarks appears in the

Bookmark pane. You may easily move to the required bookmark by clicking it in the list.

You may control bookmarks on the **Edit** menu.

Filling an area with a pattern

To fill an area with a pattern, select **Fill** on the **Edit** menu, and specify the pattern and area on the Fill dialog box.

Fill **dialog box**
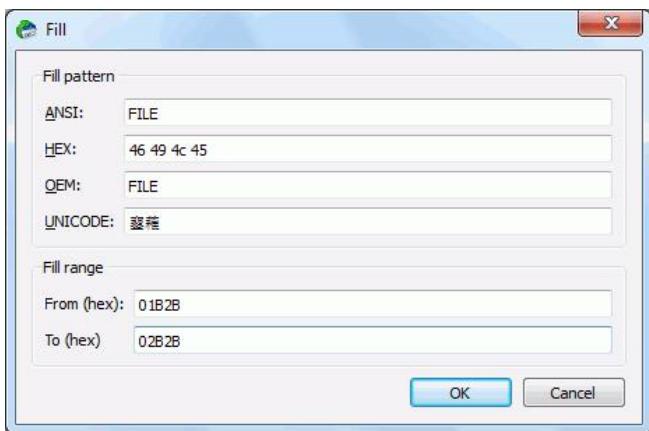
⊟ *Fill options*

Fill pattern	
HEX	Field for the pattern to fill the area in the hexadecimal representation
ANSI	Field for the pattern to fill the area in the ANSI encoding
OEM	Field for the pattern to fill the area in the OEM encoding
UNICODE	Field for the pattern to fill the area in the UNICODE encoding
Fill range	
From (hex)	Field for the start position of the area to fill with the pattern
To (hex)	Field for the end position of the area to fill with the pattern

3   **Click the Save Changes button to save the changes**

⊟ *Other ways to save the changes made*

• Select **Save Changes** on the **Edit** menu

or

• Press the **F2** key

>   **Viewer/Editor will save the changes on the object**

YOU MUST BE ABSOLUTELY SURE OF WHAT AND WHERE YOU ARE WRITING!
Or you may completely lose all your data.

Selecting and saving an area in the Viewer/Editor

You may select an area in the Viewer/Editor panel and save it as a file.

To select and save an area in the Viewer/Editor **panel,**

1   **Select Select... on the Tools menu and specify an area to select on the** Select **dialog box**, or

Click the start point of the area and drag the mouse cursor to its end.

If you need to select an entire object, select **Select All** on the **Tools** menu or click the **Ctrl+A** key

Select **dialog box**
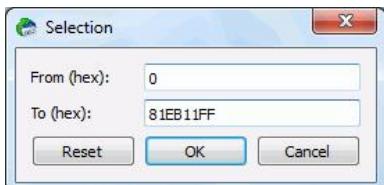
2   Select an appropriate item in the Tools menu to save the data in a required format and specify its file name

Select:

Save to Binary File...	to save the data in the binary format (default extension is .bin)
Save to Hexadecimal File	to save the data in the binary format (default extension is .hex)

on the **Tools** menu.

If a remote computer is connected for **Data Recovery over Network**, the Save as... dialog box will appear when you select a place to save the data. You may save it to the local or remote computer.
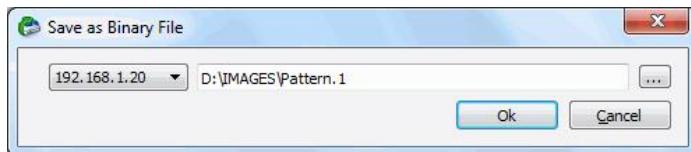
>   Viewer/Editor will save the data in the file

Loading data from an external file

You may load a data from a file and overwrite an area of the object opened in the Viewer/Editor panel.

To load binary data from a file and overwrite an area of the object opened in the Viewer/Editor **panel**,

1   Select an area to overwrite and select Load from File... on the Tools menu

If a remote computer is connected for **Data Recovery over Network**, the Open as Binary File dialog box will appear when you select a place to open the data file from. You may open it from the local or remote computer.
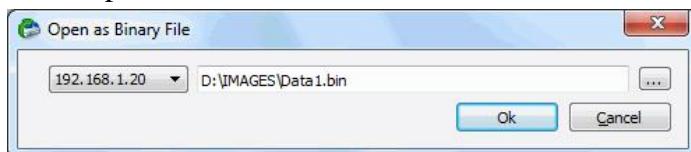
2   Select the necessary file and load the data.

>   The area in the Viewer/Editor will be overwritten with the new data.

3.2   Creating Custom Patterns

You may create your own patterns yourself.

An example of a commented pattern parsing an AVI file.

The syntax of pattern description is similar to that of the XML language. The folder where the files should be placed is specified on the Main tab of the Settings dialog box.

Pattern structure

Pattern header

Each pattern starts with a standard header

```
<?xml version="1.0" encoding="utf-8"?>
```

Section `template`

Each pattern starts with a section giving to the pattern a name that will be shown in the parsed data pane.

Attributes:

name	Specifies the pattern name shown in the parsed data pane

Example:

```
<template name="AVI File LIST">
  ........
</template>
```

Section `signature`

Attributes:

align <positive integer>	Specifies if the data structure address is aligned (i.g., by a sector: 512)

This section contains elements `field` with hex-codes of the signature. The attribute `offset` specifies their offset from the start of the record. Field length is equal to the number of hex-codes.

Example:

```
<signature align="1">
   <field offset="0">46 49</field>
   <field offset="2">4c 45</field>
</signature>
```

Section `section`

Such sections contain all expressions and operations needed for the pattern to parse the data. A section name is shown in the parsed data pane. In fact, sections are virtual objects used to group logically connected `field`s. Sections can be nested.

The main section is not shown in the parsed data pane.

Section contain elements `field` which are actual data objects. `field` names are shown in the parsed data pane with their values.

Attributes:

name	Specifies the pattern name shown in the parsed data pane

Example:

```
<section name="JUNK">
 ....
</section>
```

List of All Objects in Patterns

Data types (in `field`)

- `integer`
  Sub-types:
    `int8`
    `int16`

int32

int64

uint8

uint16

uint32

uint64

uintX

Attributes:

endian: (be | le | system)	Optional. Default: `system`.
base: (decimal | hex | octal)	Optional. Specifies data representation. Default: `decimal`.
as-offset: <expression>	Optional. Specifies that this field is an offset and its value should be evaluated using the expression. A special variable `this` returns the value of this field.
purpose: (offset | rsector | sector | cluster | rcluster)	Optional. Specifies the type of the `as-offset` expression result . If this attribute is present, the attribute is necessary if the offset value should differ from the value of this field (variable `this`). `rsector` and `rcluster` are offsets relative to the absolute position of the pattern beginning.
assigned-template: <TemplateName>	Specifies the pattern name linked with this field. Ignored if the `as-offset` or `purpose` attributes are not specified.
var: <Name>	Optional. Specifies the name under which the value of this field can be accessed in expressions.

- `binary`
  Attributes:

display-encoding: (hex | binary)	Optional. Default: `hex`.
size: <bytes>	Mandatory.

- `char`
  Attributes:

size: <bytes>	Mandatory.
codepage: (ansi | oem | utf8 | utf16)	Optional. Specifies which codepage is used. Default: `ansi`.

- `filetime`
  Shows time in the Win32 format (64 bits)

- `unixtime`
  Shows time in the Unix format (seconds from 01/01/1970)

- `filetime`
  Shows time in the DOS format (date: hiword, time: loword)

- `bits`
  Attributes:

`size: <bytes>`	Mandatory.
`pos: <comma separated list of bit positions>`	Mandatory. Specifies bit positions in a data block.

Commands

- `goto`
  Specifies a jump to a specified offset (either absolute or relative one)
  Attributes:

`address: <expression>`	Specifies an absolute address to jump to.
`offset: <expression>`	Specifies a relative offset to jump by.

One and only one of the attributes should always be specified.

- `if`
  Evaluates a condition specified in the `test` attribute and, if the condition is true, reads fields specified in this tag.
  Attribute:

`test: <expression>`	Sets a condition to test against.

- `repeat`
  Reads the fields specified in the tag until the exit condition is equal to 0 or specified times
  Attributes:

`count: <expression>`	`<expression>` is evaluated one time upon entering the block. Internal elements are read the specified number of times.
`test: <expression>`	`<expression>` is evaluated upon entering the block. Similar to the C++ construction `while(...) {}`.
`test: <expression>`	`<expression>` is evaluated upon exiting the block. Similar to the C++ construction `do {} while(...)`.

- `setvar`
  Sets the value of an internal variable. As an example, this command is convenient to store the current offset. The value of the current offset is stored in a predefined variable `offset`.
  Attributes:

`var: <string>`	Specifies the name of the variable.
`expr: <expression>`	Specifies an expression which result will be assigned to the variable.

Expressions

Expressions in the patterns are arithmetic expressions which syntax is similar to that of the C language, including operation preceding.

The following operations are supported:

`+ - * / & | > < <= >= != == || &&`

Predefined variables

- `offset`

  An offset in bytes from the pattern beginning data is currently read at.

- `start_position`

  An absolute position of the pattern beginning. `offset` + `start_position` = absolute offset.

- `this`

  This variable exists only within the context of the `ass-offset` expression evaluation and is the current value of the data field for which that expression is specified

3.3   Pattern Example I

Below is an example of a commented pattern parsing an AVI file.

```
<?xml version="1.0" encoding="utf-8"?>
<!-- A pattern section. The pattern name is AVI File. -->
<template name="AVI File">
  <!-- A template signature section. Alignment is 1. -->
  <signature align="1">
    <!-- A 4-byte signature at offset 0x00. -->
    <field offset="0x00">52 49 46 46</field> <!-- ANSI: RIFF -->
    <!-- A 4-byte signature at offset 0x08. -->
    <field offset="0x08">41 56 49 20</field> <!-- ANSI: LIST -->
  </signature>

  <!-- A data section. Its name is AVI File. This is the main data section. It is not shown in the parsing tree as
a section (its name is ignored). -->
  <section name="AVI File">
    <!-- The first 4 bytes are read and shown as an ANSI  string. -->
    <field type="char" size="4" name="Signature: RIFF" var="signature"/>
    <!--  The current position is moved to the beginning of the file. -->
    <goto offset="-4"/>
      <!-- The first 4 bytes in the file are read and shown as an unsigned integer. The internal variable
signature gets the value of the field. -->
    <field type="uint32" base="hex" name="Signature RIFF as unsigned integer in hex
format" var="signature"/>

      <!-- A test against the condition (signature == RIFF) -->
```

```
<if test="signature == 0x46464952"> <!-- ANSI: RIFF -->
```
<!-- The next 4 bytes are read and shown as an unsigned integer. The internal variable `dataSize` gets the value of the field. -->
```
<field type="uint32" name="Size of the data in file" var="dataSize"/>
```
<!-- A new internal variable `endOfFile` is created and the `expr` field evaluates its value.-->
```
<setvar var="endOfFile" expr="offset + dataSize - 8"/>
```
<!-- The next 4 bytes is read and shown as an ANSI string. -->
```
<field type="char" size="4" name="File type"/>
```

<!-- A new section named `DATA` is created -->
```
<section name="DATA">
```
<!-- A new internal variable `chunksOffset` is created, the expr filed evaluating its value. This variable gets the absolute value of template offset. -->
```
<setvar var="chunksOffset" expr="start_position"/>
```

<!-- A loop is created. Its condition is set in the test field (while the `endOfFile` variable is greater then the current position.) -->
```
<repeat test="endOfFile > offset">
```
<!-- 4 bytes are read and shown as an ANSI string. -->
```
<field type="char" size="4" name="Signature"/>
```
<!-- The current position is moved backwards by 4 bytes. -->
```
<goto offset="-4"/>
```
<!-- The same 4 bytes are read and shown as an unsigned integer. The internal variable `signature` gets this value. -->
```
<field type="uint32" name="Signature as unsigned integer" var="signature"/
>
```

<!-- A test against the condition (`signature == LIST`) -->
```
<if test="signature == 1414744396"> <!-- ANSI: LIST -->
```
<!-- The section is shown. Its name is LIST -->
```
<section name="LIST">
```
<!-- The current position is moved backward by 4 bytes. -->
```
<goto offset="-4"/>
```
<!-- The 4 bytes are read and shown as an unsigned hexadecimal integer. This field has the attributes `offset` and `assigned-template`. If the user double-clicks this field, the AVI File LIST pattern will be invoked and the current pattern position will be moved to the address specified in `as-offset`.-->
```
<field type="uint32" base="hex" name="Signature LIST as unsigned integer in hex format" as-offset="start_position + offset - 4" assigned-template="AVI File LIST"/>
```
<!-- The next 4 bytes are read and shown as an unsigned integer. The `listSize` variable gets its value. -->
```
<field type="uint32" name="Size of the data in the list"
```

```
var="listSize"/>
```
<!-- The 4 bytes are read and shown as an ANSI string. -->
```
<field type="char" size="4" name="List type"/>
```
<!-- The current position is moved backward by 4 bytes. -->
```
<goto offset="-4"/>
```
<!-- The same 4 bytes are shown as an unsigned hexadecimal integer. The `listType` variable gets its value.-->
```
<field type="uint32" base="hex" name="List type as unsigned integer in
hex format" var="listType"/>
```

<!-- A test against condition (`type == movi`)-->
```
<if test="listType == 0x69766f6d"> <!-- ANSI: movi -->
```
  <!-- The `chunksOffset` variable gets the value evaluated in the `expr` attribute. -->
```
  <setvar var="chunksOffset" expr="start_position + offset - 4"/>
 </if>
```

<!-- The current position is moved to the address evaluated in the address attribute. -->
```
<goto address="offset + listSize - 4"/>
  </section>
 </if>
```

<!-- A test against condition (`signature == JUNK`)-->
```
<if test="signature == 1263424842"> <!-- ANSI: JUNK -->
```
  <!-- The section is shown with the `JUNK` name. -->
```
 <section name="JUNK">
```
    <!-- The next 4 bytes are read and shown as an unsigned integer. The internal variable `junkSize` gets its value. -->
```
                <field type="uint32" name="Size of the data of the junk"
var="junkSize"/>
```
<!-- The current position is moved by `junkSize` bytes forward. -->
```
<goto offset="junkSize"/>
 </section>
 </if>
```

<!-- A test against condition (`signature == idx1`)-->
```
<if test="signature == 829973609"> <!-- ANSI: idx1 -->
```
  <!-- The section is shown with the `idx1` name. -->
```
<section name="idx1">
```
    <!-- The next 4 bytes are read and shown as an unsigned integer. The internal variable `idxSize` gets its value. -->
```
                <field type="uint32" name="Size of the data of the idx1"
var="idxSize"/>
```

```
<!-- The section is shown with the First AVIINDEXENTRY name. -->
<section name="First AVIINDEXENTRY">
   <!-- The 4 bytes are read and shown as an ANSI string. -->
   <field type="char" size="4" name="Chunck id"/>
   <!-- The next 4 bytes are read and shown as an unsigned hexadecimal integer. -->
   <field type="uint32" base="hex" name="Flags"/>
   <!-- The next 4 bytes are read ans shown as an unsigned hexadecimal integer. The offset
attribute is evaluated for this field as a sum of the chunksOffset variable and valued of this field. -->
   <field type="uint32" base="hex" name="Chunk offset" as-
offset="chunksOffset + this"/>
   <!-- The next 4 bytes are read and shown as an unsigned integer. -->
   <field type="uint32" name="Chunk size"/>
</section>
<!-- The current position is moved by idxSiz bytes forward. -->
<goto offset="idxSize"/>
   </section>
</if>


<!-- A test against the condition. &amp;&amp; is a logical AND (&&) -->
<if test="signature != 1414744396 &amp;&amp; signature != 1263424842
&amp;&amp; signature != 829973609">
   <!-- An empty section is shown. Its name is Unknown signature found -->
   <section name="Unknown signature found">
   </section>
   <!-- The current position is moved to the address set in the endOfFile variable. -->
   <goto address="endOfFile"/>
</if>
   </repeat>
   </section>
</if>
</section>
</template>
```

3.4   Pattern Example II

```
<?xml version="1.0" encoding="utf-8"?>
<!-- A pattern section. The  pattern name is AVI File LIST -->
<template name="AVI File LIST">
   <!-- A template signature section. Alignment is 1. -->
   <signature align="1">
      <!-- A 4-byte signature at offset 0x00. -->
      <field offset="0x00">4C 49 53 54</field> <!-- ANSI: LIST -->
   </signature>
```

<!-- A data section. Its name is AVI File LIST. This is the main data section. It is not shown in the parsing tree as a section (its name is ignored).-->

```
<section name="AVI File LIST">
```

<!-- The first 4 bytes are read and shown as an ANSI string. -->

```
<field type="char" size="4" name="Signature: LIST"/>
```

<!-- The current position is moved to the beginning of the file (4 bytes backward). -->

```
<goto offset="-4"/>
```

<!-- The first 4 bytes in the file are read and shown as an unsigned integer. The internal variable signature gets the value of the field. -->

```
<field type="uint32" name="Signature LIST as unsigned integer" var="signature"/>
```

<!-- A test against the condition (signature == LIST) -->

```
<if test="signature == 1414744396"> <!-- ANSI: LIST -->
```

<!-- The next 4 bytes are read and shown as an unsigned integer. The internal variable listSize gets its value. -->

```
<field type="uint32" name="Size of the data in the list" var="listSize"/>
<setvar var="endOfList" expr="offset + listSize"/>

<field type="char" size="4" name="List type"/>
<goto offset="-4"/>
<field type="uint32" base="hex" name="List type as unsigned integer in hex format" var="listType"/>
```

<!-- A test against condition (listType == movi) -->

```
<if test="listType == 0x69766f6d"> <!-- ANSI: movi -->
```

<!-- This chunk is not to be parsed. The current position is moved to the end of the chunk. -->

```
<goto address="endOfList"/>
</if>

<setvar var="mediaType" expr="0"/>
<repeat test="endOfList > offset - 8">
  <section name="CHUNK">
    <field type="char" size="4" name="Chunk ID"/>
    <goto offset="-4"/>
    <field type="uint32" name="Chunk ID as unsigned integer" var="chunkId"/>
    <if test="chunkId == 1414744396"> <!-- ANSI: LIST -->
      <goto offset="-4"/>
<field type="uint32" base="hex" name="LIST chunk ID as unsigned integer in hex format" as-offset="start_position + offset - 4" assigned-template="AVI File LIST"/>
      </if>
```

```
            <field type="uint32" name="Size of the data in the chunk" var="chunkSize"/
>

            <setvar var="endOfChunk" expr="offset + chunkSize"/>

            <!-- Rounding the value of the variable endOfChunk to a number divisible by 2. -->
            <if test="endOfChunk &amp; 1">
              <setvar var="endOfChunk" expr="endOfChunk &amp; 0xFFFFFFFE"/>
              <setvar var="endOfChunk" expr="endOfChunk + 2"/>
            </if>

            <if test="chunkId == 1751742049"> <!-- ANSI: avih -->
              <field type="uint32" name="Number of microseconds between frames"/>
              <field type="uint32" name="Approximate maximum data rate of the file"/>
              <field type="uint32" name="Alignment for data, in bytes"/>
                <field type="uint32" name="Bitwise combination of zero or more of the
flags"/>
              <field type="uint32" name="Total number of frames of data in the file"/>
              <field type="uint32" name="Initial frame for interleaved files"/>
              <field type="uint32" name="Number of streams in the file"/>
              <field type="uint32" name="Suggested buffer size for reading the file"/>
              <field type="uint32" name="Width of the AVI file in pixels"/>
              <field type="uint32" name="Height of the AVI file in pixels"/>
              <field type="binary" size="16" name="Reserved"/>
            </if>

            <if test="chunkId == 1852994675"> <!-- ANSI: strn -->
              <field type="char" size="chunkSize" name="Stream name"/>
            </if>

            <if test="chunkId == 1752331379"> <!-- ANSI: strh -->
              <field type="char" size="4" name="Type"/>
              <goto offset="-4"/>
                <field type="uint32" base="hex" name="Type as unsigned integer in hex
format" var="type"/>
              <setvar var="mediaType" expr="type"/>
              <field type="char" size="4" name="Handler (codec)"/>
              <field type="uint32" base="hex" name="Flags"/>
               <field type="uint32" name="Number of the first block of the stream that
is present in the file"/>
              <field type="uint32" name="Scale"/>
```

```
            <field type="uint32" name="Rate"/>
            <field type="uint32" name="Start time of stream"/>
             <field type="uint32" name="Size of stream in units as defined in Rate
and Scale"/>
             <field type="uint32" name="Size of buffer necessary to store blocks of
that stream"/>
            <field type="uint32" name="Quality"/>
             <field type="uint32" name="Sample size (number of bytes of one stream
atom)"/>
          </if>


          <if test="chunkId == 1718776947"> <!-- ANSI: strf -->
            <if test="mediaType == 0x73646976"> <!-- ANSI: vids -->
              <section name="BITMAPINFOHEADER">
                      <field type="uint32" name="Number of bytes required by the
structure"/>
               <field type="int32" name="Width of the bitmap, in pixels"/>
               <field type="int32" name="Height of the bitmap, in pixels"/>
               <field type="uint16" name="Number of planes for the target device"/>
               <field type="uint16" name="Number of bits-per-pixel"/>
                 <field type="uint32" name="Type of compression for a compressed
bottom-up bitmap"/>
               <field type="uint32" name="Size, in bytes, of the image"/>
                  <field type="int32" name="Horizontal resolution, in pixels-per-
meter, of the target device for the bitmap"/>
                 <field type="int32" name="Vertical resolution, in pixels-per-meter,
of the target device for the bitmap"/>
                   <field type="uint32" name="Number of color indexes in the color
table that are actually used by the bitmap"/>
                 <field type="uint32" name="Number of color indexes that are required
for displaying the bitmap"/>
                </section>
              </if>


            <if test="mediaType == 0x73647561"> <!-- ANSI: auds -->
              <section name="WAVEFORMATEX">
                <field type="uint16" name="Waveform-audio format type"/>
                 <field type="uint16" name="Number of channels in the waveform-audio
data"/>
                      <field type="uint32" name="Sample rate, in samples per second
(hertz)"/>
                  <field type="uint32" name="Required average data-transfer rate, in
bytes per second, for the format tag"/>
```

```
                <field type="uint16" name="Block alignment, in bytes"/>
                    <field type="uint16" name="Bits per sample for the Waveform-audio
format type"/>
                        <field type="uint16" name="Size, in bytes, of extra format
information appended to the end of the WAVEFORMATEX structure"/>
            </section>
          </if>
        </if>

        <goto address="endOfChunk"/>
      </section>
    </repeat>

  </if>

  <if test="signature != 1414744396">
    <section name="Invalid LIST signature found">
    </section>
  </if>

  </section>
</template>
```

IV   Technical Information and Troubleshooting

This chapter covers various technical issues and troubleshooting.
- **IntelligentScan technology**
- **Data Recovery Issues**
- **Extended Information Recovery**
- **Data Formats**
- **Data Recovery on HFS/HFS+ file system**
- **Bad Sectors**
- **Memory Usage**
- **Forensic Mode**
- **R-Studio Switches**
- **Properties Tab**

R-Studio Features
Contact Information and Technical Support
Data Recovery Using R-Studio
Basic File Recovery
Advanced Data Recovery
Mass File Recovery
Volume Sets and RAIDs
Data Recovery over Network
Text/hexadecimal editor
R-Studio Emergency
R-Studio Agent Emergency

4.1   IntelligentScan Technology

R-Studio uses a unique *IntelligentScan* technology when it tries to recover the data on the area being scanned.

While scanning the selected area, **R-Studio** reads data directly from the disk, analyzes them, and tries to determine a record to which the data belong. The following record types are possible:
- MBR record
- NTFS Boot Sector record
- FAT Boot Sector record
- MFT record
- NTFS Folder record
- FAT record
- FAT Folder record
- Ext2/3/4FS SuperBlocks record
- UFS/FFS SuperBlock record
- HFS/HFS+ Volume Header
- HFS/HFS+ BTree+ Node

All these record types have different, but known, structure. Knowing valid values of record fields and relations between them for each record type, **R-Studio** determines a record type for the data. If such record type cannot be unambiguously determined, the data are assigned to the most probable record type. The same data can be assigned to several record types, with a certain probability for each assignment. A list of possible files is generated from these records.

R-Studio generates a record list for each record type. This list contains references to records assigned to a record type from the list with their assignment probability. The same data can be included into different record lists. Then **R-Studio** analyzes relations between elements in each list and between different lists, and generates a list of found partitions with their parameters, such as partition start point and probable size, file system type, cluster size, and existence probability.

Using the file list and partition list, **R-Studio** reconstructs file systems and files on the found partitions. One file can be attributed to several different partitions.

When the entire disk or its part has been scanned, **R-Studio** shows all found partitions. Then the parameters of the found partitions may be manually corrected, if additional information on them is available.

Using the *IntelligentScan* technology, **R-Studio** can recover files not only on new and existing partitions. It also can find and recover data on partitions that have been deleted or reformatted. If, for example, there was an NTFS partition, which later was reformatted as a FAT partition, **R-Studio** will show two partitions on the same place on the disk, one having the FAT file system, the other the NTFS. Then, files found on those partitions can be recovered.

The *IntelligentScan* technology makes **R-Studio** a very powerful data recovery tool, but it is not omnipotent. As it uses probabilistic approach to data reconstruction, it cannot guarantee 100% correct results. Moreover, even if **R-Studio** has reconstructed data structure correctly, it is impossible to guarantee that all found files will be completely and correctly recovered, as new data may be already written over the old files. See the **Data Recovery Issues** topic for details.

4.2   Data Recovery Issues

NEVER TRY TO SAVE RECOVERED FILES/FOLDERS TO THE SAME LOGICAL DISK WHERE THEY RESIDE!!!
Or you may obtain unpredictable results and lose all of your data.

R-Studio writes directly to a hard drive only when writing recovered data and from its hex editor, if writing is enabled. In all other actions, **R-Studio** only reads data and analyzes them, and never modifies data on the hard drives being analyzed.

Most operating systems use lazy-write. So, there is a time lag between file actions and actual changes on data on a hard drive. **R-Studio** analyzes data on hard drives only. That is why it does not always detect recent changes in data structure.

Most operating systems constantly write their service information on hard drives. Such writing is especially intensive during startup and shutdown procedures. When an operating system deletes a file/folder, it treats the space where it has resided as empty and may write something in this place. If this happened, the file/folder and its parameters may be detected correctly, but its data may be lost.

Folder names like **$$$Folder58448** on NTFS partitions mean that the folder has not been found on the drive but some references to it have been. For example, folders My documents, Work, Photos have been found and all they have one parent folder, whose description has not actually been found on the disk, so its name is unknown and therefore represented as **$$$Folder58448**. It may happen that the description of such folders was outside

of the scan area, so try to enlarge the region or scan the entire hard drive. If that does not help, most likely that the description of the folder has been overwritten.

Folder names like **$ROOT58448** on FAT partitions mean that some folders have been found, but they cannot be included into the folder structure for this FAT partition. Sometimes, such folders may contain other folder structures.

If you recover a file, and it appears that the file contains wrong data, try to do the following:

- **Scan**:

  the logical disk, if the file has been just deleted.

  the hard drive, if the data structure is damaged more seriously.

- **Search for the file** to be restored on all found partitions and try to recover it from all found partitions. Check each recovered file to ensure that it contains correct data. As soon as you found the partition from which the file is recovered correctly, use this partitions to recover all other deleted files.

If there are several deleted files to be restored, you should use a file larger than 2KB to select the required partition.

Cross-Linked Folders

Often **R-Studio** finds several FAT folder records that contain the same data. Such folders are called *cross-linked*. **R-Studio** marks such folders with an arrow mark:

R-Studio attributes the content of cross-linked folders to one folder called a *target folder*. When recovering, **R-Studio** places the content to the target folder.

To view the list of cross-linked folders,

1 **Right-click a cross-linked folder and select Cross Linked Folders on the shortcut menu**

> **A list of cross-linked folders will appear**

You may go to any folder in this list by clicking it.

To find a target folder,

* **Right-click a cross-linked folder and select Go Target on the shortcut menu,** or

Select the cross-linked folder and select **Goto Target** on the **File** menu

If **Go Target** is gray, this folder is already the target folder.

To set the target folder manually,

* **Right-click a cross-linked folder and select Set As Default Target on the shortcut menu**, or

Select the cross-linked folder and select **Set As Default Target** on the **File** menu.

If **Set As Default Target** is gray, this folder is already the target folder.

Questionable Folders

Sometimes, **R-Studio** may find FAT records, which look like folders, but their content is invalid. For example, file names have invalid characters, date, time, and size, or other file attributes may look strange. Please note that **R-Studio** correctly recognizes localized names. **R-Studio** treats such records as folders, but does not analyze their content and structure. You can manually scan such folders, but results may be unpredictable. Usually, such scan reveals garbage.

R-Studio marks such folders with a question mark.

To re-scan an object,

*   **Right-click a questionable folder on the R-Studio's** Folders **panel and select Rescan on the shortcut menu,** or

Select the questionable folder and select **Rescan** on the **File** menu.

4.3   Extended Information Recovery

R-Studio supports recovery of compressed files, alternative data streams, encrypted files, file security and extended file attributes. If the **R-Studio** host OS and the file system of the disk you are going to save file to support any particular extended information, it will be saved with the file, too. Otherwise, the extended information will be saved as separate files with the same name as the restored file and extension showing the type of the extended information. Below is a quick reference for the host OS and file system of the target drive.

Extended Information	Required host OS	Required target disk FS
Encrypted files	Windows 2000/XP/2003/ Vista/2008/7	NTFS
Alternative data streams	Windows NT/2000/XP/2003/ Vista/2008/7	NTFS
File security	Windows NT/2000/XP/2003/ Vista/2008/7	NTFS
Extended file attributes	Windows NT/2000/XP/2003/ Vista/2008/7	NTFS or FAT

4.4   Data Formats

You may enter data in all numerical fields either in sectors or in bytes. If there is no letters are after the number, **R-Studio** assumes the numbers are in bytes.

Decimal numbers are entered as they are: `2372354`

Hexadecimal numbers are entered as `0x23Fa67` or `23Fa67 hex`.

The following case-insensitive notation is possible:

`b`	1 byte
`kb`	1 kb = 2^10=1024 bytes
`mb`	1 mb = 2^20=104857 bytes
`gb`	1 gb = 2^30=1073741824 bytes
`tb`	1 tb = 2^40=1099511627776 bytes
`eb`	1 eb = 2^50=1125899906842624 bytes
`hex`	A hexadecimal number
`sec` (sector)	A number is in sectors

4.5   Data Recovery on HFS/HFS+ File System

When deleting a file, Mac OS X deletes system BTree+ records describing the file. Therefore, it is hard to recover such file directly. Those records may remain in:

1. The swap file (if the deleted file has been deleted recently).
2. In the journal (if the HFS+ journaling is on, and the deleted file has been CREATED recently)

Actually, if a file has been deleted, chances that the records would be found are small. To greatly increase the chances to recover deleted files successfully , you may actively use scanning with enabled <u>Known Files Types</u>.

Note: All above is correct for intentionally deleted files. In case of a corrupted file system, HFS/HFS+ can be recovered quite successfully.

When recovering files with HFS+-specific attributes (resource fork, finder info, etc.), **R-Studio** saves it in the so-called <u>AppleDouble</u> format. When they are copied to an HFS+ disk under Mac OS X, those attributes will be automatically restored.

4.6   Bad Sectors

Quite often, drives from which the data are to be recovered have bad sectors, or those sectors that are very hard, even impossible, to read, mostly due to hardware problems. **R-Studio** tries to read such sectors several times. The number of tries is specified either on the <u>Settings/Bad Sectors</u> dialog box, or on the <u>Properties</u> tab, the Drive Control section, for each drive separately.

When **R-Studio** encounters such bad sectors while performing various tasks and they appear unreadable, it treats them as follows:

Object images:

R-Studio fills the space in the image file where the bad sectors should be with the pattern specified in the Pattern to fill bad blocks field on the <u>Settings/Bad Sectors</u> dialog box. Please note that **R-Studio** writes the pattern on the image, not on the source drive.

Files

If Skip files with bad sectors on the <u>Recovery</u> dialog box is cleared, **R-Studio** fills bad sectors in the recovered file with the pattern specified on the the <u>Settings/Bad Sectors</u> dialog box. Information about such files will appear in the <u>Log</u>.

If Skip files with bad sectors on the <u>Recovery</u> dialog box is selected, **R-Studio** skips files with bad sectors and displays their list on the Files with bad sectors dialog box when the recovery has been completed. You may select files to immediately recover them or to mark for later recovery. You may also save this list to a text file.

Files with bad sectors **dialog box**
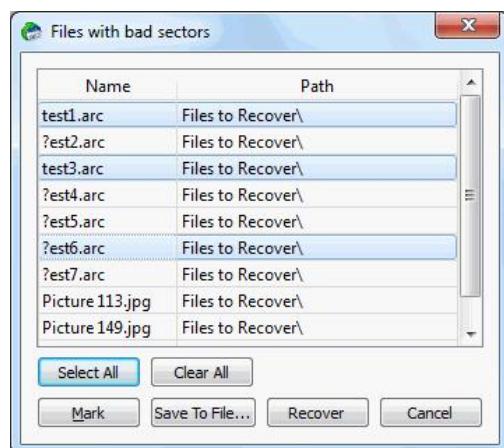
⊟*Files with bad sectors Buttons*

Select All	Click this button to select all files in the list.
Clear All	Click this button to unselect all selected files.
Mark	Click this button to mark all selected files in the list.

| Save to File | Click this button to save the list of files with bad sectors to a text file. |
| Recover | Click this button to immediately recover selected files. The bad sectors in the recovered files will be filled with the pattern specified in the `Pattern to fill bad blocks` field on the <u>Settings/Bad Sectors</u> dialog box. |

Objects edited in the Text/hexadecimal editor/viewer

Bad sectors in the objects viewed/edited in the **Text/hexadecimal editor** are shown as filled with the pattern specified in the `Pattern to fill bad blocks` field on the <u>Settings/Bad Sectors</u> dialog box.
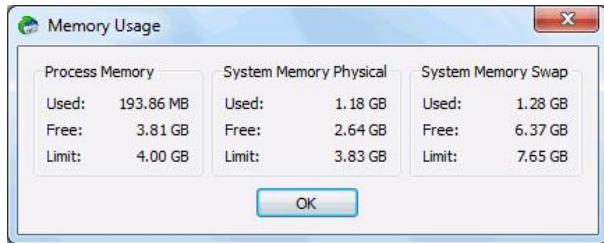
4.7   Memory Usage

You may see how much memory **R-Studio** uses while performing a data recovery task. This is especially useful when scanning large disks on a computer with limited resources. You may specify memory control options on the `Memory usage` tab in the **R-Studio Settings**.

To view memory usage,

1   Select Memory usage on the Tools menu

>   R-Studio will show the total memory in your computer and how much memory it uses

Memory usage **dialog box**

⊟ *Memory usage*

Process Memory	Shows how much memory **R-Studio** uses. `Limit` shows how much memory your system can virtually allocate to **R-Studio**. Actual memory allocation depends also on the RAM and swap file sizes.
System Memory Physical	Shows how much RAM is in your system
System Memory Swap	Shows how much virtual memory is in your system

4.8   Forensic Mode

Note: This feature is available for the Technician version of **R-Studio** only!

When this mode is enabled, **R-Studio** will generate a forensic data collection audit log that can be presented at court hearings. This log includes information about a hardware configuration on which the forensic data collection takes place and MD5 for recovered files.

Note: A new log will be generated each time the hardware configuration is changed (a hard drive is connected/disconnected, an external USB device is connected/disconnected, etc)

To enable this feature,

* **Select Enable Forensic Mode on the** Main **tab of the** <u>Settings</u> **dialog box.**
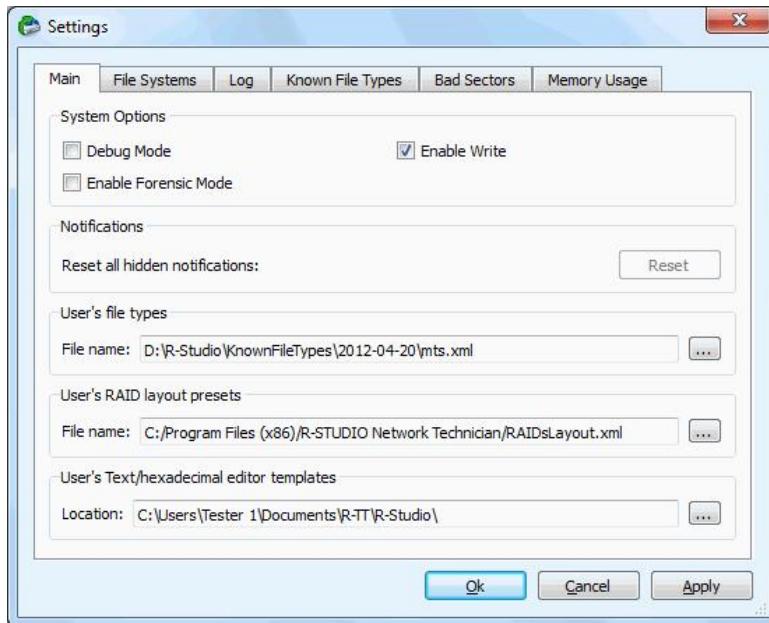
Each time you start file recovery, the Forensic Log Settings dialog box will appear.

> Forensic Log Settings **dialog box**
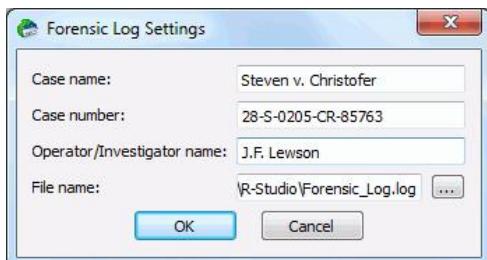
Enter the required information and click the **OK** button to go to the <u>Recovery</u> dialog box.

While file recovery, **R-Studio** will create forensic data collection audit log in the specified folder. Below is an example of such log.

```
******************************* Forensic Data Collection Audit Log
*******************************

R-STUDIO Network Technician 6.2.153589/2/3/2013

Case Name: Steven v. Christofer
Case Number: 28-S-0205-CR-85763
Operator / Investigator Name: J.F. Lewson

**************************************** Drives Information
****************************************

- Drive Number 0 --------------------------------
* Drive Type [256 bytes]: Computer,Local Computer
* Name [30 bytes]: Local Computer
```

* OS [74 bytes]: Windows 7 Build 7601, Service Pack 1
* System [150 bytes]: 4 x Intel(R) Core(TM) i3 CPU   530 @ 2.93GHz, 2933
MHz, 3919 MB RAM

- Drive Number 3 -------------------------------
* Drive Type [256 bytes]: CDROM
* Name [54 bytes]: PIONEERDVD-RW DVR-219L1.00
+ Device Identification [8 bytes]:
  * Vendor [32 bytes]: PIONEER
  * Product [64 bytes]: DVD-RW DVR-219L
  * Firmware [16 bytes]: 1.00
+ SCSI Address [8 bytes]:
  * Port Number [1 bytes]: 3
  * Path Id [1 bytes]: 1
  * Target Id [1 bytes]: 0
  * Lun [1 bytes]: 0

- Drive Number 4 -------------------------------
* Drive Type [256 bytes]: Physical Drive,Disk
* Name [52 bytes]: WDC WD75AA-00BAA010.09K11
* OS Object [38 bytes]: \\.\PhysicalDrive0
* R-Studio Driver [44 bytes]: WinNT\Handle\Physical
* Size [8 bytes]: 7.02GB (14726880 sec)
* Sector Size [4 bytes]: 512B
* Partition Size [8 bytes]: 7.02GB (14726880 sec)
# I/O Tries [4 bytes]: Default
+ Drive Control [8 bytes]:
  # Maximum Transfer [4 bytes]: 131072
  # I/O Unit [4 bytes]: 512
  # Buffer Alignment [4 bytes]: 2
+ Physical Drive Geometry [8 bytes]:
  * Cylinders [8 bytes]: 916
  * Tracks Per Cylinder [4 bytes]: 255
  * Sectors Per Track [4 bytes]: 63
  * Sector Size [4 bytes]: 512B
Partition Layout Sector Size [4 bytes]: 512B
+ Device Identification [8 bytes]:
  * Product [64 bytes]: WDC WD75AA-00BAA0
  * Firmware [16 bytes]: 10.09K11
  * Serial Number [32 bytes]: WD-WMA2L2883101
+ SCSI Address [8 bytes]:
  * Port Number [1 bytes]: 0
  * Path Id [1 bytes]: 0
  * Target Id [1 bytes]: 0
  * Lun [1 bytes]: 0
* Bus Type [4 bytes]: IDE/ATA
+ IDE Properties [8 bytes]:
  * Buffer [116 bytes]: 2 MB, Dual ported multi-sector buffer with a read caching
  * ECC Bytes [2 bytes]: 40
  * PIO Modes [16 bytes]: 1,2,3,4
  * DMA Modes [12 bytes]: 0,1,2
  * UltraDMA Modes [20 bytes]: 0,1,2,3,4
  * Current Mode [22 bytes]: UltraDMA 4

```
* Int13 Drive Number [4 bytes]: 0x81


- Drive Number 5 -------------------------------
* Drive Type [256 bytes]: Physical Drive,Disk
* Name [32 bytes]: ST3320418ASCC44
* OS Object [38 bytes]: \\.\PhysicalDrive1
* R-Studio Driver [44 bytes]: WinNT\Handle\Physical
* Size [8 bytes]: 298GB (625142448 sec)
* Sector Size [4 bytes]: 512B
* Partition Size [8 bytes]: 298GB (625142448 sec)
# I/O Tries [4 bytes]: Default
+ Drive Control [8 bytes]:
  # Maximum Transfer [4 bytes]: 131072
  # I/O Unit [4 bytes]: 512
  # Buffer Alignment [4 bytes]: 2
+ Physical Drive Geometry [8 bytes]:
  * Cylinders [8 bytes]: 38913
  * Tracks Per Cylinder [4 bytes]: 255
  * Sectors Per Track [4 bytes]: 63
  * Sector Size [4 bytes]: 512B
# Partition Layout Sector Size [4 bytes]: 512B
+ Device Identification [8 bytes]:
  * Product [64 bytes]: ST3320418AS
  * Firmware [16 bytes]: CC44
  * Serial Number [32 bytes]: 9VMMRZKW
+ SCSI Address [8 bytes]:
  * Port Number [1 bytes]: 2
  * Path Id [1 bytes]: 0
  * Target Id [1 bytes]: 0
  * Lun [1 bytes]: 0
* Bus Type [4 bytes]: SerialATA-II
+ IDE Properties [8 bytes]:
  * Buffer [12 bytes]: 16 MB
  * ECC Bytes [2 bytes]: 4
  * PIO Modes [16 bytes]: 1,2,3,4
  * DMA Modes [12 bytes]: 0,1,2
  * UltraDMA Modes [28 bytes]: 0,1,2,3,4,5,6
  * Current Mode [22 bytes]: UltraDMA 5
* Int13 Drive Number [4 bytes]: 0x80


- Drive Number 6 -------------------------------
* Drive Type [256 bytes]: Volume
* Name [90 bytes]: Volume{445abf3b-13ef-11e0-b147-806e6f6e6963}
* OS Object [98 bytes]: \\?\Volume{445abf3b-13ef-11e0-b147-806e6f6e6963}
* R-Studio Driver [42 bytes]: WinNT\Handle\Logical
* Size [8 bytes]: 100MB (204800 sec)
* Sector Size [4 bytes]: 512B
* Partition Offset [8 bytes]: 1.00MB (2048 sec)
* Partition Size [8 bytes]: 100MB (204800 sec)
* Partition Number [4 bytes]: 1
* Partition Type [256 bytes]: NTFS/HPFS
+ NTFS Information [8 bytes]:
  * Cluster Size [4 bytes]: 4.00KB (8 sec)
```

```
  * MFT Record Size [4 bytes]: 1.00KB
  * MFT Position [8 bytes]: 33.3MB (68264 sec)
  * MFT Mirror Position [8 bytes]: 8.00KB (16 sec)
  * Index Block Size [4 bytes]: 4.00KB
  * Sector Size [4 bytes]: 512B
  * Volume Size [8 bytes]: 99.9MB (204799 sec)
# I/O Tries [4 bytes]: Default
+ Drive Control [8 bytes]:
  # Maximum Transfer [4 bytes]: 131072
  # I/O Unit [4 bytes]: 512
  # Buffer Alignment [4 bytes]: 2
+ Physical Drive Geometry [8 bytes]:
  * Cylinders [8 bytes]: 38913
  * Tracks Per Cylinder [4 bytes]: 255
  * Sectors Per Track [4 bytes]: 63
  * Sector Size [4 bytes]: 512B
+ SCSI Address [8 bytes]:
  * Port Number [1 bytes]: 2
  * Path Id [1 bytes]: 0
  * Target Id [1 bytes]: 0
  * Lun [1 bytes]: 0
* Bus Type [4 bytes]: IDE/ATA

- Drive Number 7 -------------------------------
* Drive Type [256 bytes]: Volume,Disk
* Name [6 bytes]: F:
* Mount Points [8 bytes]: F:\
* OS Object [98 bytes]: \\?\Volume{ccb23f8c-1302-11e2-8330-20cf30be3944}
* R-Studio Driver [42 bytes]: WinNT\Handle\Logical
* Size [8 bytes]: 2.92GB (6136766 sec)
* Sector Size [4 bytes]: 512B
* Partition Offset [8 bytes]: 32.0KB (64 sec)
* Partition Size [8 bytes]: 2.92GB (6136766 sec)
* Partition Number [4 bytes]: 1
* Partition Type [256 bytes]: NTFS/HPFS
+ NTFS Information [8 bytes]:
  * Cluster Size [4 bytes]: 2.00KB (4 sec)
  * MFT Record Size [4 bytes]: 1.00KB
  * MFT Position [8 bytes]: 12.0KB (24 sec)
  * MFT Mirror Position [8 bytes]: 302KB (604 sec)
  * Index Block Size [4 bytes]: 4.00KB
  * Sector Size [4 bytes]: 512B
  * Volume Size [8 bytes]: 2.92GB (6136700 sec)
# I/O Tries [4 bytes]: Default
+ Drive Control [8 bytes]:
  # Maximum Transfer [4 bytes]: 131072
  # I/O Unit [4 bytes]: 512
  # Buffer Alignment [4 bytes]: 2
+ Physical Drive Geometry [8 bytes]:
  * Cylinders [8 bytes]: 916
  * Tracks Per Cylinder [4 bytes]: 255
  * Sectors Per Track [4 bytes]: 63
  * Sector Size [4 bytes]: 512B
```

```
+ SCSI Address [8 bytes]:
  * Port Number [1 bytes]: 0
  * Path Id [1 bytes]: 0
  * Target Id [1 bytes]: 0
  * Lun [1 bytes]: 0
* Bus Type [4 bytes]: IDE/ATA

- Drive Number 8 -------------------------------
* Drive Type [256 bytes]: Volume,Disk
* Name [6 bytes]: G:
* Mount Points [8 bytes]: G:\
* OS Object [98 bytes]: \\?\Volume{e0651538-ace3-11e1-8eff-20cf30be3944}
* R-Studio Driver [42 bytes]: WinNT\Handle\Logical
* Size [8 bytes]: 2.02GB (4257161 sec)
* Sector Size [4 bytes]: 512B
* Partition Offset [8 bytes]: 2.92GB (6136893 sec)
* Partition Size [8 bytes]: 2.02GB (4257161 sec)
* Partition Number [4 bytes]: 2
* Partition Type [256 bytes]: FAT32
+ FAT Information [8 bytes]:
  * FAT Bits (12,16,32) [4 bytes]: 32
  * Cluster Size [4 bytes]: 4.00KB (8 sec)
  * First Cluster Offset [8 bytes]: 4.06MB (8322 sec)
  * Root Directory Cluster [4 bytes]: 2
  * First FAT Offset [8 bytes]: 19.0KB (38 sec)
  * Size of One FAT Table [8 bytes]: 2.02MB (4150 sec)
  * Number of FAT Copies [4 bytes]: 2
  # Active FAT copy [4 bytes]: Auto
  * Sector Size [4 bytes]: 512B
  * Major Version [1 bytes]: 0
  * Minor Version [1 bytes]: 0
  * Volume Size [8 bytes]: 2.02GB (4257161 sec)
# I/O Tries [4 bytes]: Default
+ Drive Control [8 bytes]:
  # Maximum Transfer [4 bytes]: 131072
  # I/O Unit [4 bytes]: 512
  # Buffer Alignment [4 bytes]: 2
+ Physical Drive Geometry [8 bytes]:
  * Cylinders [8 bytes]: 916
  * Tracks Per Cylinder [4 bytes]: 255
  * Sectors Per Track [4 bytes]: 63
  * Sector Size [4 bytes]: 512B
+ SCSI Address [8 bytes]:
  * Port Number [1 bytes]: 0
  * Path Id [1 bytes]: 0
  * Target Id [1 bytes]: 0
  * Lun [1 bytes]: 0
* Bus Type [4 bytes]: IDE/ATA

- Drive Number 9 -------------------------------
* Drive Type [256 bytes]: Volume,Disk
* Name [6 bytes]: H:
* Mount Points [8 bytes]: H:\
```

```
* OS Object [98 bytes]: \\?\Volume{e0651537-ace3-11e1-8eff-20cf30be3944}
* R-Studio Driver [42 bytes]: WinNT\Handle\Logical
* Size [8 bytes]: 2.00GB (4208966 sec)
* Sector Size [4 bytes]: 512B
* Partition Offset [8 bytes]: 4.95GB (10394118 sec)
* Partition Size [8 bytes]: 2.00GB (4208966 sec)
* Partition Number [4 bytes]: 3
* Partition Type [256 bytes]: FAT16 (big)
+ FAT Information [8 bytes]:
  * FAT Bits (12,16,32) [4 bytes]: 16
  * Cluster Size [4 bytes]: 32.0KB (64 sec)
  * First Cluster Offset [8 bytes]: 209KB (418 sec)
  * Root Directory Offset [8 bytes]: 263168
  * Root Directory Length [4 bytes]: 16.0KB
  * First FAT Offset [8 bytes]: 1.00KB (2 sec)
  * Size of One FAT Table [8 bytes]: 128KB (256 sec)
  * Number of FAT Copies [4 bytes]: 2
  # Active FAT copy [4 bytes]: Auto
  * Sector Size [4 bytes]: 512B
  * Major Version [1 bytes]: 0
  * Minor Version [1 bytes]: 0
  * Volume Size [8 bytes]: 1.99GB (4193698 sec)
# I/O Tries [4 bytes]: Default
+ Drive Control [8 bytes]:
  # Maximum Transfer [4 bytes]: 131072
  # I/O Unit [4 bytes]: 512
  # Buffer Alignment [4 bytes]: 2
+ Physical Drive Geometry [8 bytes]:
  * Cylinders [8 bytes]: 916
  * Tracks Per Cylinder [4 bytes]: 255
  * Sectors Per Track [4 bytes]: 63
  * Sector Size [4 bytes]: 512B
+ SCSI Address [8 bytes]:
  * Port Number [1 bytes]: 0
  * Path Id [1 bytes]: 0
  * Target Id [1 bytes]: 0
  * Lun [1 bytes]: 0
* Bus Type [4 bytes]: IDE/ATA

- Drive Number 10 ------------------------------
* Drive Type [256 bytes]: Volume,Disk
* Name [6 bytes]: C:
* Mount Points [8 bytes]: C:\
* OS Object [98 bytes]: \\?\Volume{445abf3c-13ef-11e0-b147-806e6f6e6963}
* R-Studio Driver [42 bytes]: WinNT\Handle\Logical
* Size [8 bytes]: 121GB (255793152 sec)
* Sector Size [4 bytes]: 512B
* Partition Offset [8 bytes]: 101MB (206848 sec)
* Partition Size [8 bytes]: 121GB (255793152 sec)
* Partition Number [4 bytes]: 2
* Partition Type [256 bytes]: NTFS/HPFS
+ NTFS Information [8 bytes]:
  * Cluster Size [4 bytes]: 4.00KB (8 sec)
```

```
     * MFT Record Size [4 bytes]: 1.00KB
     * MFT Position [8 bytes]: 3.00GB (6291456 sec)
     * MFT Mirror Position [8 bytes]: 8.00KB (16 sec)
     * Index Block Size [4 bytes]: 4.00KB
     * Sector Size [4 bytes]: 512B
     * Volume Size [8 bytes]: 121GB (255793151 sec)
 # I/O Tries [4 bytes]: Default
 + Drive Control [8 bytes]:
     # Maximum Transfer [4 bytes]: 131072
     # I/O Unit [4 bytes]: 512
     # Buffer Alignment [4 bytes]: 2
 + Physical Drive Geometry [8 bytes]:
     * Cylinders [8 bytes]: 38913
     * Tracks Per Cylinder [4 bytes]: 255
     * Sectors Per Track [4 bytes]: 63
     * Sector Size [4 bytes]: 512B
 + SCSI Address [8 bytes]:
     * Port Number [1 bytes]: 2
     * Path Id [1 bytes]: 0
     * Target Id [1 bytes]: 0
     * Lun [1 bytes]: 0
 * Bus Type [4 bytes]: IDE/ATA

 - Drive Number 11 -------------------------------
 * Drive Type [256 bytes]: Volume,Disk
 * Name [6 bytes]: D:
 * Mount Points [8 bytes]: D:\
 * OS Object [98 bytes]: \\?\Volume{605e4bfe-13f3-11e0-be0a-20cf30be3944}
 * R-Studio Driver [42 bytes]: WinNT\Handle\Logical
 * Size [8 bytes]: 176GB (369137664 sec)
 * Sector Size [4 bytes]: 512B
 * Partition Offset [8 bytes]: 122GB (256000000 sec)
 * Partition Size [8 bytes]: 176GB (369137664 sec)
 * Partition Number [4 bytes]: 3
 * Partition Type [256 bytes]: NTFS/HPFS
 + NTFS Information [8 bytes]:
     * Cluster Size [4 bytes]: 4.00KB (8 sec)
     * MFT Record Size [4 bytes]: 1.00KB
     * MFT Position [8 bytes]: 3.00GB (6291456 sec)
     * MFT Mirror Position [8 bytes]: 8.00KB (16 sec)
     * Index Block Size [4 bytes]: 4.00KB
     * Sector Size [4 bytes]: 512B
     * Volume Size [8 bytes]: 176GB (369137663 sec)
 # I/O Tries [4 bytes]: Default
 + Drive Control [8 bytes]:
     # Maximum Transfer [4 bytes]: 131072
     # I/O Unit [4 bytes]: 512
     # Buffer Alignment [4 bytes]: 2
 + Physical Drive Geometry [8 bytes]:
     * Cylinders [8 bytes]: 38913
     * Tracks Per Cylinder [4 bytes]: 255
     * Sectors Per Track [4 bytes]: 63
     * Sector Size [4 bytes]: 512B
```

```
+ SCSI Address [8 bytes]:
  * Port Number [1 bytes]: 2
  * Path Id [1 bytes]: 0
  * Target Id [1 bytes]: 0
  * Lun [1 bytes]: 0
* Bus Type [4 bytes]: IDE/ATA

- Drive Number 12 -------------------------------
* Drive Type [256 bytes]: Volume,CDROM
* Name [6 bytes]: E:
* Mount Points [8 bytes]: E:\
* OS Object [98 bytes]: \\?\Volume{445abf3f-13ef-11e0-b147-806e6f6e6963}
* R-Studio Driver [42 bytes]: WinNT\Handle\Logical
# I/O Tries [4 bytes]: Default
+ Drive Control [8 bytes]:
  # Maximum Transfer [4 bytes]: 131072
  # I/O Unit [4 bytes]: 2048
  # Buffer Alignment [4 bytes]: 2
+ SCSI Address [8 bytes]:
  * Port Number [1 bytes]: 3
  * Path Id [1 bytes]: 1
  * Target Id [1 bytes]: 0
  * Lun [1 bytes]: 0
* Bus Type [4 bytes]: IDE/ATAPI

- Drive Number 13 -------------------------------
* Drive Type [256 bytes]: Partition,Logical
* Name [22 bytes]: Partition1
* Mount Points [8 bytes]: F:\
* Size [8 bytes]: 2.92GB (6136766 sec)
* Partition Offset [8 bytes]: 32.0KB (64 sec)
* Partition Size [8 bytes]: 2.92GB (6136766 sec)
* Partition Number [4 bytes]: 1
* Partition Type [256 bytes]: NTFS/HPFS
+ NTFS Information [8 bytes]:
  * Cluster Size [4 bytes]: 2.00KB (4 sec)
  * MFT Record Size [4 bytes]: 1.00KB
  * MFT Position [8 bytes]: 12.0KB (24 sec)
  * MFT Mirror Position [8 bytes]: 302KB (604 sec)
  * Index Block Size [4 bytes]: 4.00KB
  * Sector Size [4 bytes]: 512B
  * Volume Size [8 bytes]: 2.92GB (6136700 sec)

- Drive Number 14 -------------------------------
* Drive Type [256 bytes]: Partition,Logical
* Name [22 bytes]: Partition2
* Mount Points [8 bytes]: G:\
* Size [8 bytes]: 2.02GB (4257161 sec)
* Partition Offset [8 bytes]: 2.92GB (6136893 sec)
* Partition Size [8 bytes]: 2.02GB (4257161 sec)
* Partition Number [4 bytes]: 2
* Partition Type [256 bytes]: FAT32
+ FAT Information [8 bytes]:
```

```
  * FAT Bits (12,16,32) [4 bytes]: 32
  * Cluster Size [4 bytes]: 4.00KB (8 sec)
  * First Cluster Offset [8 bytes]: 4.06MB (8322 sec)
  * Root Directory Cluster [4 bytes]: 2
  * First FAT Offset [8 bytes]: 19.0KB (38 sec)
  * Size of One FAT Table [8 bytes]: 2.02MB (4150 sec)
  * Number of FAT Copies [4 bytes]: 2
  # Active FAT copy [4 bytes]: Auto
  * Sector Size [4 bytes]: 512B
  * Major Version [1 bytes]: 0
  * Minor Version [1 bytes]: 0
  * Volume Size [8 bytes]: 2.02GB (4257161 sec)

- Drive Number 15 ------------------------------
* Drive Type [256 bytes]: Partition,Logical
* Name [22 bytes]: Partition3
* Mount Points [8 bytes]: H:\
* Size [8 bytes]: 2.00GB (4208966 sec)
* Partition Offset [8 bytes]: 4.95GB (10394118 sec)
* Partition Size [8 bytes]: 2.00GB (4208966 sec)
* Partition Number [4 bytes]: 3
* Partition Type [256 bytes]: FAT16 (big)
+ FAT Information [8 bytes]:
  * FAT Bits (12,16,32) [4 bytes]: 16
  * Cluster Size [4 bytes]: 32.0KB (64 sec)
  * First Cluster Offset [8 bytes]: 209KB (418 sec)
  * Root Directory Offset [8 bytes]: 263168
  * Root Directory Length [4 bytes]: 16.0KB
  * First FAT Offset [8 bytes]: 1.00KB (2 sec)
  * Size of One FAT Table [8 bytes]: 128KB (256 sec)
  * Number of FAT Copies [4 bytes]: 2
  # Active FAT copy [4 bytes]: Auto
  * Sector Size [4 bytes]: 512B
  * Major Version [1 bytes]: 0
  * Minor Version [1 bytes]: 0
  * Volume Size [8 bytes]: 1.99GB (4193698 sec)

- Drive Number 16 ------------------------------
* Drive Type [256 bytes]: Empty Space
* Name [28 bytes]: Empty Space16
* Size [8 bytes]: 60.4MB (123796 sec)
* Partition Offset [8 bytes]: 6.96GB (14603084 sec)
* Partition Size [8 bytes]: 60.4MB (123796 sec)

- Drive Number 17 ------------------------------
* Drive Type [256 bytes]: Partition,Active
* Name [22 bytes]: Partition1
* Size [8 bytes]: 100MB (204800 sec)
* Partition Offset [8 bytes]: 1.00MB (2048 sec)
* Partition Size [8 bytes]: 100MB (204800 sec)
* Partition Number [4 bytes]: 1
* Partition Type [256 bytes]: NTFS/HPFS
+ NTFS Information [8 bytes]:
```

```
 * Cluster Size [4 bytes]: 4.00KB (8 sec)
 * MFT Record Size [4 bytes]: 1.00KB
 * MFT Position [8 bytes]: 33.3MB (68264 sec)
 * MFT Mirror Position [8 bytes]: 8.00KB (16 sec)
 * Index Block Size [4 bytes]: 4.00KB
 * Sector Size [4 bytes]: 512B
 * Volume Size [8 bytes]: 99.9MB (204799 sec)

- Drive Number 18 ------------------------------
* Drive Type [256 bytes]: Partition,Primary
* Name [22 bytes]: Partition2
* Mount Points [8 bytes]: C:\
* Size [8 bytes]: 121GB (255793152 sec)
* Partition Offset [8 bytes]: 101MB (206848 sec)
* Partition Size [8 bytes]: 121GB (255793152 sec)
* Partition Number [4 bytes]: 2
* Partition Type [256 bytes]: NTFS/HPFS
+ NTFS Information [8 bytes]:
 * Cluster Size [4 bytes]: 4.00KB (8 sec)
 * MFT Record Size [4 bytes]: 1.00KB
 * MFT Position [8 bytes]: 3.00GB (6291456 sec)
 * MFT Mirror Position [8 bytes]: 8.00KB (16 sec)
 * Index Block Size [4 bytes]: 4.00KB
 * Sector Size [4 bytes]: 512B
 * Volume Size [8 bytes]: 121GB (255793151 sec)

- Drive Number 19 ------------------------------
* Drive Type [256 bytes]: Partition,Primary
* Name [22 bytes]: Partition3
* Mount Points [8 bytes]: D:\
* Size [8 bytes]: 176GB (369137664 sec)
* Partition Offset [8 bytes]: 122GB (256000000 sec)
* Partition Size [8 bytes]: 176GB (369137664 sec)
* Partition Number [4 bytes]: 3
* Partition Type [256 bytes]: NTFS/HPFS
+ NTFS Information [8 bytes]:
 * Cluster Size [4 bytes]: 4.00KB (8 sec)
 * MFT Record Size [4 bytes]: 1.00KB
 * MFT Position [8 bytes]: 3.00GB (6291456 sec)
 * MFT Mirror Position [8 bytes]: 8.00KB (16 sec)
 * Index Block Size [4 bytes]: 4.00KB
 * Sector Size [4 bytes]: 512B
 * Volume Size [8 bytes]: 176GB (369137663 sec)


************************************************************************
****************

--------------------------------------------- Session 1
---------------------------------------------
START Date / Time of Collection: 2013-02-06 22:09:29


Source drive:Sector    Modification Date      MD5
     File Name
```

```
8                    2012-12-04 19:53:00
   Music
  File Data
       3966106-3966113
8                    2012-12-04 19:53:50
   Music\Carl Orff CarminaBurana
  File Data
       3966114-3966121
8                    2008-05-10 12:31:54    e3ed08b18d2dfe4fffa90fc7e5b7f1ac
   Music\Carl Orff CarminaBurana\a_young_girl.mp3
  File Data
       3966122-3974289
8                    2008-05-10 12:28:44    96a828f7d852871c2a8707a918b2a26a
   Music\Carl Orff CarminaBurana\boiling_rage.mp3
  File Data
       3974290-3983473
8                    2008-05-10 12:32:50    aeabe7bdc208dd47a1bc6fb6810c7455
   Music\Carl Orff CarminaBurana\come_my_beauty.mp3
  File Data
       3983474-3990817
8                    2008-05-10 12:27:38    f6d9d74f36ccf747c947da697a88e8a8
   Music\Carl Orff CarminaBurana\if_the_whole_world_was_mine.mp3
  File Data
       3990818-3993353
8                    2008-05-10 12:30:38    855047c9885454adff15d8343f9f4792
   Music\Carl Orff CarminaBurana\in_the_tavern.mp3
  File Data
       3993354-4000649
8                    2008-05-10 12:30:58    1b8588242e838d32b6477657ad2d410a
   Music\Carl Orff CarminaBurana\love_flies_everywhere.mp3
  File Data
       4000650-4006017, 4006018-4006697
8                    2008-05-10 12:22:30    2f5d751b174e6e6c575dfb5980351011
   Music\Carl Orff CarminaBurana\sunrise.mp3
  File Data
       4006698-4013025
8                    2008-05-10 12:26:32    64eb19ac44e2bfcd0481c9c8b11d80a1
   Music\Carl Orff CarminaBurana\sweetest_boy.mp3
  File Data
       4013026-4014601
8                    2008-05-10 12:26:02    7cf363567fc0a7d3945dd7fe43c2022b
   Music\Carl Orff CarminaBurana\the_dance.mp3
  File Data
       4014602-4021481
8                    2008-05-10 12:19:52    47b8aadf4db862f4f6ab7ab0ea98eb53
   Music\Carl Orff CarminaBurana\the_face_of_spring.mp3
  File Data
       4021482-4033465
8                    2008-05-10 12:36:36    222faa73045887b591fd69c0131b1c8a
   Music\Carl Orff CarminaBurana\the_lovers.mp3
  File Data
       4033466-4037073
```

```
8                    2008-05-10 12:29:40      8c0935c960b42c4c4b3b034efb1a301a
   Music\Carl Orff CarminaBurana\the_roasted_swan.mp3
   File Data
       4037074-4043233
8                    2008-05-10 12:38:38      c9fcfaf50a336c6619f42afefa2d9525
   Music\Carl Orff CarminaBurana\the_wheel_of_fortune.mp3
   File Data
       4043234-4052081
8                    2008-05-10 12:14:46      8292a5f076dd419499234f554eeb890f
   Music\Carl Orff CarminaBurana\the_wounds_of_fate.mp3
   File Data
       4052082-4062641
8                    2008-05-10 12:23:20      7743d3e148f833f524bf99c0e58a60fc
   Music\Carl Orff CarminaBurana\welcome.mp3
   File Data
       4062642-4070417
8                    2012-12-04 19:55:40
   Music\Elton_John
   File Data
       4070418-4070425
8                    2008-04-27 18:09:38      700c87da7656c365d7a066caecccc48b
   Music\Elton_John\02-A Word in Spanish.mp3
   File Data
       4070426-4071553, 4071554-4083369
8                    2001-10-04 16:41:16      8ff86aa42faaa1169fd14635126945e4
   Music\Elton_John\04-Club At The End Of The Street.mp3
   File Data
       4083370-4096873
8                    2008-04-27 18:10:40      ee22ed32d77106baf6ba0adaf9384d7c
   Music\Elton_John\05-Sorry Seems to Be the Hardest Word.mp3
   File Data
       4096874-4107633
8                    2001-10-04 16:41:24      dd11b71234d0f11926878da8f156bdab
   Music\Elton_John\07-Sacrifice.mp3
   File Data
       4107634-4121921
8                    2001-10-04 16:41:24      43efe3779b6bd5d9a3d7692ada485302
   Music\Elton_John\08-I Newer Knew Her Name.mp3
   File Data
       4121922-4131777
8                    2008-04-27 18:11:32      a201b3be4ecb6dd3b4ca6558954824c4
   Music\Elton_John\09-Candy By The Pound.mp3
   File Data
       4131778-4137089, 4137090-4142793
8                    2001-10-04 16:41:30      c27400f5d678252ea2a2b9a9dd2603d4
   Music\Elton_John\10-Blue avenue.mp3
   File Data
       4142794-4155081
8                    2008-04-27 18:12:02      d5892763c3becea6afec39210e71a917
   Music\Elton_John\12-I'm Your Puppet.mp3
   File Data
       4155082-4165097
```

```
8                    2008-04-27 18:09:22    326c5af71d036f97c1adfd210b574995
  Music\Elton_John\AlbumArtSmall.jpg
  File Data
      4165098-4165105
8                    2008-04-27 18:05:46    317359a14280c519ce8d1f3e4fe607a2
  Music\Elton_John\AlbumArt_{00FEB343-A4EF-48C0-A58B-0321C72AFB82}_Large.jpg
  File Data
      4165106-4165113, 4165114-4165137
8                    2008-04-27 18:04:58    0aecba6783c8d3dc9331acadd3394203
  Music\Elton_John\AlbumArt_{00FEB343-A4EF-48C0-A58B-0321C72AFB82}_Small.jpg
  File Data
      4165138-4165145
8                    2008-04-27 18:10:04    d75dd97722a8cb3b5d645d280e81b93b
  Music\Elton_John\AlbumArt_{6609CAD8-CCF6-4FE7-BB50-D79D8DA92302}_Large.jpg
  File Data
      4165146-4165153, 4165154-4165161
8                    2008-04-27 18:08:22    5235095d98e89f6d03847668788cc00a
  Music\Elton_John\AlbumArt_{6609CAD8-CCF6-4FE7-BB50-D79D8DA92302}_Small.jpg
  File Data
      4165162-4165169
8                    2008-04-27 18:10:32    0854eac43624b3ff0a3735ca1463d841
  Music\Elton_John\AlbumArt_{758956AA-1FD8-41D1-BEC1-BAF69BCF80DC}_Large.jpg
  File Data
      4165170-4165177, 4165178-4165185
8                    2008-04-27 18:09:22    326c5af71d036f97c1adfd210b574995
  Music\Elton_John\AlbumArt_{758956AA-1FD8-41D1-BEC1-BAF69BCF80DC}_Small.jpg
  File Data
      4165186-4165193
8                    2008-04-27 18:08:08    1c1f55cfa551c80ae01494470d5a0ad6
  Music\Elton_John\AlbumArt_{AD88489E-F38C-4942-B531-7BE274FACDB2}_Large.jpg
  File Data
      4165194-4165201, 4165202-4165217
8                    2008-04-27 18:07:06    d0ecfea1f078c4457e90412a15ff558c
  Music\Elton_John\AlbumArt_{AD88489E-F38C-4942-B531-7BE274FACDB2}_Small.jpg
  File Data
      4165218-4165225
8                    2008-04-27 18:11:12    1252d6a3aef8f3efa58fce8391182166
  Music\Elton_John\?esktop.ini
  File Data
      4165226-4165233
8                    2007-06-07 05:07:38    ecb10bc7c33aefb1f30949cc737070e9
  Music\Elton_John\Elton_John-02.MP3
  File Data
      4165234-4176001
8                    2007-06-07 05:08:06    d2dbfb298bb2638c3b57d7c679dfe94a
  Music\Elton_John\Elton_John-03.MP3
  File Data
      4176002-4191169
8                    2007-06-07 05:08:24    09753362b96e24585b4a5915ae3250de
  Music\Elton_John\Elton_John-04.MP3
  File Data
      4191170-4200257
```

```
8                     2007-06-07 05:09:46        ab933d4eba7f0f36888d7ef44c73f415
   Music\Elton_John\Elton_John-08.MP3
  File Data
       4200258-4202625, 4202626-4217089
8                     2007-06-07 05:12:12        9312b2e9a7496b02ba1d6547ca109367
   Music\Elton_John\Elton_John-15.MP3
  File Data
       4217090-4228729
8                     2007-06-07 05:12:44        724c5db8a39b7ea61e0ca196c06c96e5
   Music\Elton_John\Elton_John-17.MP3
  File Data
       4228730-4236537
8                     2008-04-27 18:10:32        0854eac43624b3ff0a3735ca1463d841
   Music\Elton_John\Folder.jpg
  File Data
       4236538-4236545, 4236546-4236553
8                     2012-12-04 19:55:38        6ca1829fb46c96917e6e61a54d75d0f4
   Music\Elton_John\AlbumArtSmall.jpg
  File Data
       1066442-1066449
8                     2012-12-04 19:55:38        6ca1829fb46c96917e6e61a54d75d0f4
   Music\Elton_John\AlbumArt_{00FEB343-A4EF-48C0-A58B-0321C72AFB82}_Small.jpg
  File Data
       1066450-1066457
8                     2012-12-04 19:55:40        61ee818e8e3041c22d1d64f4aea053f3
   Music\Elton_John\?esktop.ini
  File Data
       1066522-1066529
8                     2012-12-04 19:53:58
   Music\Manu_Chao
  File Data
       4236554-4236561
8                     2002-05-21 16:04:52        cb7c1b923d38e16087ba8a90a5b2c9fa
   Music\Manu_Chao\01-Clandestino.mp3
  File Data
       4236562-4243529
8                     2002-05-21 16:05:36        9b7e1c8711230d72b487a8f26967657d
   Music\Manu_Chao\02-Desaparecido.mp3
  File Data
       4243530-4254193
8                     2002-06-24 22:35:42        c67a50c2b40ca8d68cf51a825c65dd1f
   Music\Manu_Chao\03-Bongo Bong.mp3
  File Data
       4254194-4257153, 344370-348833
8                     2002-06-24 22:36:50        e1be88d37a71ba4d8f95a1b8ebeb135d
   Music\Manu_Chao\04-Je Ne T'Aime Plus.mp3
  File Data
       348834-354593
8                     2002-06-24 22:37:22        ba2e9970e88c4060c4a286f596cb4975
   Music\Manu_Chao\05-Mentira....mp3
  File Data
       354594-367585
```

```
8                      2002-05-21 16:05:36      ebdb3355e7cc9a35237d1fe6d9ee7d6e
   Music\Manu_Chao\06-Lagrimas De Oro.mp3
   File Data
       367586-375921
8                      2002-05-21 16:05:36      b934faff976af01937157d4c7bdd4ce1
   Music\Manu_Chao\10-Welcome To Tijuana.mp3
   File Data
       375922-387377
8                      2002-05-21 16:05:36      0367c0565f6ef3da3d97d668c0b25695
   Music\Manu_Chao\15-La Despedida.mp3
   File Data
       387378-396281
8                      2008-04-27 19:03:06      df78baa97be4093cae95909a6f94d5fe
   Music\Manu_Chao\AlbumArtSmall.jpg
   File Data
       396282-396289
8                      2008-04-27 19:03:20      38e457ed886866f93335968a8638ad08
   Music\Manu_Chao\AlbumArt_{A0F31A58-545E-4020-9120-DB47553C0B48}_Large.jpg
   File Data
       396290-396313
8                      2008-04-27 19:03:06      df78baa97be4093cae95909a6f94d5fe
   Music\Manu_Chao\AlbumArt_{A0F31A58-545E-4020-9120-DB47553C0B48}_Small.jpg
   File Data
       396314-396321
8                      2008-04-27 19:03:40      afcc0d798665335141014707f4f4ae33
   Music\Manu_Chao\?esktop.ini
   File Data
       396322-396329
8                      2008-04-27 19:03:20      38e457ed886866f93335968a8638ad08
   Music\Manu_Chao\Folder.jpg
   File Data
       396330-396353
8                      2012-12-04 19:44:14
   Video
   File Data
       1056914-1056921
8                      2011-01-22 13:19:16      7b1c1214777f91c71dfbfec0b79e2e3d
   Video\Cirque.Du.Soleil.Kooza.2008.avi
   File Data
       1109602-1122433, 1122434-1187969, 1187970-1253505, 1253506-1319041,
1319042-1384577, 1384578-1450113, 1450114-1515649, 1515650-1581185, 1581186-
1646721, 1646722-1712257, 1712258-1777793, 1777794-1843329, 1843330-1908865,
1908866-1974401, 1974402-2039937, 2039938-2105473, 2105474-2171009, 2171010-
2236545, 2236546-2302081, 2302082-2367617, 2367618-2433153, 2433154-2498689,
2498690-2564225, 2564226-2629761, 2629762-2695297, 2695298-2760833, 2760834-
2826369, 2826370-2891905, 2891906-2957441, 2957442-3022977, 3022978-3088513,
3088514-3154049, 3154050-3219585, 3219586-3285121, 3285122-3350657, 3350658-
3416193, 3416194-3481729, 3481730-3547265, 3547266-3612801, 3612802-3678337,
3678338-3743873, 3743874-3809409, 3809410-3874945, 3874946-3940481, 3940482-3966097

END Date / Time of Collection: 2013-02-06 22:11:30
-------------------------------------------------------------------------------
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```

4.9 R-Studio Switches

If there are problems in starting **R-Studio** and while working with it, you may use switches to avoid them.

The following switches are available:

`-all_drives`	Forces **R-Studio** to show all logical disks in the system. Normally **R-Studio** shows only local disks in the system. Some storage devices may pretend that they are not local disks.
`-debug`	Includes additional debug information. When this switch is used, an additional command **Create FS Snapshot** on the shortcut menu appears for an object with a file system. An FS Snapshot contains system data for the file system only (file descriptions without file contents). If a problem appears, this snapshot can be sent to **R-Studio** technical support to identify the problem. This switch greatly slows **R-Studio**. You may also turn this mode on by selecting **Debug Mode** on the <u>Settings</u> dialog box.
`-flush`	Flushes the log file after each write to log operations. This switch is helpful when **R-Studio** locks and its log file remains in memory cache unwritten to a disk. This switch greatly slows **R-Studio**.
`-log <filename>`	Started with this switch, **R-Studio** writes its log into the specified file. If **R-Studio** locks and its log file remains in memory cache unwritten to a disk, use the `-flush` switch.
`-mem <size in MB>`	Sets memory usage limit in MB for **R-Studio** to reconstruct the file tree. When it exceeds the limit, a Too many files... message appears. You may temporally stop file listing and browse through found files. Then you can resume file listing. You also may skip this file section and continue file listing. Example: `-mem 400` - sets the limit to 400 MB.
`-no_ide_ext`	Turns off the inquiry about extended information on HDDs in Wind9x/ME. This switch may be helpful if **R-Studio** returns information about HDDs incorrectly (detects HDD geometry incorrectly).
`-no_int13`	Turns off the disc access through Int13 in Wind9x/ME. This switch may be helpful if the system operates incorrectly (detects HDD geometry incorrectly or lock the system).
`-no_ios`	Turns off the Wind9x/ME protected-mode I/O system. This switch may be helpful if this system operates incorrectly (detects HDD geometry incorrectly or lock the system).
`-reset`	**R-Studio** resets an HDD controller each time it reads a bad sector. This switch may be helpful if the controller locks after it attempts to read a bad sector, or returns incorrect data.
`-safe`	Disables automatic partition search on a hard drive, file system recognition on partitions, and other potentially problematic operations. In this mode, it is necessary to use **Find partition** command from the hard drive shortcut menu to manually find a partition.

If an unrecognized problem appears, start **R-Studio** with the `-debug` and `-log <filename>` switches, and send the log and screenshot of the **R-Studio** main panel to the **R-Studio** technical support:

R-Studio Technical Support Team is available 24 hours a day, seven days a week, and has an average

response time less than 4 hours.

4.10   Properties Tab

Object size units

You may select the units in which the information on object sizes will be displayed. Some parameters can be edited when the Debug mode is turned on on the Main dialog box of the **R-Studio** settings.

To select the units

1   **Select Properties on the View menu**

2   **Select the units in which you want to see object sizes.**

You may select
Show as Bytes
Show as Sectors
Show as Bytes and Sectors

1.Basic information

This section shows basic information for a disk object.

⊟ *More information...*

Drive Type	Device/disk type and subtype. Current **R-Studio** version supports the following types: Disk, WORM, CDROM, Optical, Changer, Floppy, RAM Disk, LDM Partition, LDM Component, LDM Volume and subtypes: Device, OS File, Physical Drive, Mount Point, Partition, Volume Set, Mirror, Stripe Set, RAID 4, RAID 5, RAID 6
Name	Device/disk name
Size	Device/disk size
Bus Type	Device/disk bus type. Can be: IDE/ATA, IDE/ATAPI, SCSI, Floppy, USB, 1394, SSA, FibreChannel, RAID, SMART, ABIOS

2.Information on hard drives and logical disks

This section shows available information on hard drives and logical disks. These properties depend on the drive/disk type and appear only when applicable. Under Windows NT/2000/XP/2003/Vista/2008/7, an IDE drive/disk may be represented as a SCSI device, that is why the SCSI Address section appears under these OSes for those drives/disks.

⊟ *More information...*

OS object	Appears for image files under Windows 9x/ME and NT/2000/XP/2003/Vista/2008/7, for drives/disks under Windows NT/2000/XP/2003/Vista/2008/7 only. An object name used by OS to access the device/disk.
R-Studio driver	Driver names (both internal and OS) used to access this drive/disk.
Sector Size	Drive/disk sector size
Physical Drive Geometry	This section shows physical geometry for a hard drive. For a logical disk it shows the physical geometry for a hard drive where the logical disk resides
Cylinders	
Tracks Per Cylinder	
Sectors Per Track	

Sector Size	
Device Identification	This section shows vendor information for the drive/disk
Vendor	
Product	
Firmware	
Bus	
SCSI Address	This section shows SCSI information for the drive/disk
Port Number	
Path ID	
Target ID	
Lun	
Windows 9x/ME adds the following properties:	
Int13 Drive Number	128 for the first hard drive accessible through Int13, 129 for the second one, etc. 0...128 for drives and other devices accessible through a Windows 9x/ME protected mode driver, if their Int13 device option is disabled. **R-Studio** can use Int13 disk access, and for some drive types, like SCSI devices, Int13 access is preferable. You may consider enabling the Int13 device option in the Windows Device Manager for such devices.
Int13 Extension Version	Int13 Extension Version Support for hard drives. Extended Int13 support is necessary for large drives. If this property is zero, Extended Int13 is not supported, otherwise, it shows Extended Int13 standard version, the large, the better.

3. Properties controlling access to hard drives and logical disks

This section shows properties that control access (read and write) to hard drives and logical disks. They are set to their optimal values and should be altered only if access problems appear.

☐ *More information...*

Drive Control	
Maximum transfer	Maximum data size that can be read or written during a single access to the drive. If there are problems with drive access, decrease the value of this property
I/O Unit	Data size read or written during a single access to the drive is a multiple value of this property. If there are problems with drive access, decrease the value of this property
Buffer Alignment	Drive data transfer buffer is positioned at an address multiple value of this property. If there are problems with drive access, increase the value of this property.
These three properties are set by OS drivers. If the drivers set incorrect values, problems may appear during data transfer operations. You can alter them until data transfer becomes stable.	
I/O Tries	Number of read/write tries during access to the drive. If there are bad sectors on the drive, increase the value of this property. This may help to successfully read those sectors. Sometimes, if the I/O Tries parameter is set too large and there are some unreadable sectors on the hard drive, the hard drive-controller pair may refuse to perform any successive read/write operations with the entire hard drive when it fails to read/write such sectors. In this case, set this parameter to zero. The default value is specified on the Settings (Bad Sectors) panel.

4.Partition properties

A *partition* is a continuous area on a hard drive, characterized by its offset and size. There are partitions on basic disks, dynamic disks, and recognized volumes and partitions. **R-Studio** treats regions like partitions.

 ▣ *More information...*

Partition Offset	Initial offset for the partition.
Partition Size	Size of the partition.
Partition Type	File system type for the partition. If the record in the drive partition table is incorrect, this property may differ from the actual file system type for this partition. Still, **R-Studio** will process this partition correctly, as it does not use this property.
Partition number	Appears under Windows NT/2000/XP/2003/Vista/2008/7 only. Shows the number of the partition on the physical drive.
For regions and recognized partitions, Partition Offset and Partition Type properties can be manually corrected.	

5.Compound volume properties

A *compound volume* is a union of several partitions or other disk objects. Each union type has its own rules, unique for each compound volume type. Among compound volumes are: *Volume Sets* (RAIDs Level 0), *Mirrors* (RAIDs Level 1), *RAIDs4/5/6* (RAIDs Level 4/5/6), both physical and created by the user (*Virtual Volume Sets*, *Virtual Stripe Sets*, *Virtual Mirrors*, *Virtual RAID5*).

 ▣ *More information...*

Main properties of compound volumes are *parents* (disk objects from which a compound volume is created) and their order. These properties may be viewed in the Parents tab. For user-created compound volumes these properties may be altered.	
Raid Block Size	Data block size for compound volumes of RAID (Level 0-5) types

6.LDM disks and volumes (Dynamic Disks)

LDM disks and volumes are volumes controlled by Logical Disk Manager (LDM). They are represented on a hard drive as a LDM database rather than partition tables. Under Windows 2000/XP/2003/Vista/2008/7, LDM disks are also called *Dynamic Disks*.

 ▣ *More information...*

Offset of Logical Disk	Initial offset of a logical disk on a hard drive. For disks, initially formatted by LDM, this value is often **31.5KB**, for converted disks, it may be larger.
Supposed Parents Count	Supposed number of parent partitions for compound LDM volumes. If the LDM database is not damaged, the value of this property must be equal to the number of parent objects in the Parents tab for the disk object.
LDM Host GUID	Global Unique Identifier of a computer system where this LDM disk group has been created.
LDM DiskGroup GUID	Global Unique Identifier of the LDM disk group.
LDM Disk GUID	Global Unique Identifier of the hard drive.
LDM Volume GUID	Global Unique Identifier of the volume.
LDM Disk ID	Local hard drive Identifier, unique within this LDM disk group.
LDM Partition ID	Local partition Identifier, unique within this LDM disk group.
LDM Component ID	Local component Identifier, unique within this LDM disk group.

LDM Volume ID	Local volume Identifier, unique within this LDM disk group.
LDM Disk AltName	Additional Alternative Name given by LDM to the hard drive.
LDM Disk DriveHint	Last name of the volume, under which is has been mounted in the system. May be either a letter (C:, D:, etc.), or a mount point under Windows 2000/XP/2003/Vista/2008/7.

7. File System Volume properties

A *File System (FS) volume* is a disk object where a certain, supported by **R-Studio**, file system is present. There are two FS volume types: FS volume on a regular disk object and a recognized volume, found by a scan process. FS volume properties depend on volume's file system and type.

7.1. NTFS Volume properties

These properties are present for all NTFS volumes and represent their main properties. For *recognized volumes*, these values can be altered.

⊟ *More information...*

NTFS Information	Regular volumes
Recognized NTFS	Recognized volumes
Cluster Size	Cluster size for the NTFS volume.
MFT record size	Size of one MFT record describing one file on the NTFS volume. This is an important property of any NTFS volume. Its common value is 1KB. If this property has incorrect value, many files may be incorrectly recovered.
Sector Size	Sector size for the physical drive. This property is read from the boot sector of the NTFS volume and does not affect **R-Studio** operation.
Index Block Size	Index block size for the NTFS volume. This property determines binary trees used to store NTFS folder structure. It does not affect **R-Studio** operation.
MFT position	MFT offset from the start of the NTFS volume.
MFT Mirror Position	Second MFT copy offset from the start of the NTFS volume.
Volume size	Size of the NTFS volume. This property does not affect **R-Studio** operation.

7.2. FAT Volume properties

These properties are present for all FAT volumes and represent their main properties. For *recognized volumes*, these values can be altered.

⊟ *More information...*

FAT Information	Regular volumes
Recognized FAT	Recognized volumes
FAT Bits (12,16,32)	FAT type. 12 for the FAT12, 16 for the FAT16, 32 for the FAT32.
Cluster Size	Cluster size for the FAT volume.
First Cluster Offset	Offset of the first cluster from the start of the FAT volume.
Boot Directory Cluster	(*For FAT32 only.*) Cluster number where the root directory starts on the FAT volume where the logical disk resides.
Root Directory Offset	(*For FAT12 and 16 only.*) Root directory offset from the start of the FAT volume.
Root Directory Length	(*For FAT12 and 16 only.*) Root directory length for the FAT volume.

First FAT Offset	Offset for the first FAT table on the volume. Together with the Size of One Fat Table property, is a most important property for a FAT volume. If this property is incorrect, many files (especially fragmented ones) may be incorrectly recovered.
Size of One FAT Table	Size of one FAT table on the volume.
Sector Size	Sector size of the hard drive. This property is read from the boot sector of the FAT volume and does not affect **R-Studio** operation.
Number of FAT Copies	Number of FAT copies on the FAT volume.
Active FAT copy	Active FAT table number for the FAT volume. Can be set to Disabled, Auto, 1, or 2. If it is Disabled, **R-Studio** processes the volume as there is no FAT table present. This may be useful if the volume has been reformatted and thus a new FAT table is created and the old one is deleted. In this case, it is reasonable to recover files from the previous volume without processing the new and irrelevant FAT table. All files will be recovered as continuous byte chains beginning from their start cluster. Unfragmented files will be recovered successfully. If it is 1 or 2, **R-Studio** uses the first or second FAT table copy, respectively. If it is Auto, **R-Studio** uses both FAT table copies and decides, which FAT table copy should be used for a particular FAT table sector. This may be useful when both FAT tables are partially damaged.
Major version	FAT version.
Minor version	FAT minor version.
Volume size	Size of the volume.

7.3. Ext2/3/4FS Volume properties

These properties are present for all Ext2/3/4FS volumes and represent their main properties. For *recognized volumes*, these values can be altered.

☐ *More information...*

Ext2FS Information	Regular volumes
Recognized Ext2FS	Recognized volumes
Block Size	Block size of Ext2FS file system. A block in the Ext2/3/4FS file system is similar to a cluster in the FAT file system.
First SuperBlock Offset	Offset of the first SuperBlock from the start of the Ext2/3/4FS volume.
Blocks Per Volume	Number of blocks in the Ext2/3/4FS volume.
INodes Per Volume	Number of inodes on the Ext2/3/4FS volume. An inode is a record describing file's size, attributes, position on an Ext2F/3/4S volume - all information about a file, except its name, which is stored separately. Therefore, the INodes Per Volume parameter is equal to the maximum number of files on an Ext2/3/4FS volume.
Creator OS	The OS that created this Ext2/3/4FS volume. May be Linux, Hurd, Masix, FreeBSD, Lites.
Major version	Ext2/3/4FS version. Usually 1.
Minor version	Ext2/3/4FS minor version. Usually 0.
Last Mount Time	Last mount time for this Ext2/3/4FS volume.
Last Write Time	Last write time for this Ext2/3/4FS volume.

Last Check Time	Last check time for this Ext2/3/4FS volume.
Volume size	Size of the volume.

7.4.Recognized Volume properties

These properties are present for all *recognized volumes*, regardless of their file system type. They estimate how reliable those volumes are recognized. This is useful for fast search for, and selection of, optimally recognized volume to recover.

▣ *More information...*

Parsed File Entries	Number of files proving that this recognized volume existed. May have any non-negative values. The main property characterizing the reliability of volume recognition. The larger it, the higher probability that this recognized volume has file system properties that have been correctly found.
Parsed Boot Records	Number of boot records proving that this recognized volume existed. May be 0 or 1. This is the second important property characterizing the reliability of volume recognition.
Estimated Size	Estimated size of the recognized FS partition/volume. This property shows the most probable size of the recognized FS partition/volume. Alternatively, Size and Partition Size are set to the highest possible values in order to recover the maximum number of files.

V   Working with the Third-Party Hardware

The Technician version of **R-Studio** can work together with third-party hardware developed for in-depth data recovery. Currently, the following devices are supported:

- **DeepSpar Disk Imager™**

5.1   DeepSpar Disk Imager™

DeepSpar Disk Imager™ (**DDI**) is an HDD imaging device specifically built for data recovery from hard drives with hardware issues. It greatly increases imaging speed, accuracy, and integrity of data retrieved from such drives.

The main features that **DDI** provides when working with hard drives are the following:

- Direct low-level access to a hard drive bypassing the computers BIOS.
- Disabling specific drive read/write heads.
- Disable SMART subsystem, Bad Sector Reallocation, and Read Look-Ahead
- Read sector timeout controlled by Software/Hardware/PHY drive reset commands
- Bit level analysis of corrupted data to filter out the read-write channel noise
- Fully customizable multi-pass imaging

And many more others an advanced disk imager must have. You may learn more about **DDI** on its vendor site: **DeepSpar Disk Imager™**.

DeepSpar Disk Imager™ basics

The main idea of data recovery with **DDI** is to clone data from the source hard drive with a certain level of hardware malfunction to a clone drive and perform data recovery operations either from the clone drive or while data is being cloned. Such approach greatly reduces tear and wear of the source hard drive and reduces further deterioration of its state.

There are two modes in which **DDI** processes disks:

- **DDI** clones the entire source hard drive to the source one consequently, sector by sector. Any further data recovery will be made from the clone HDD.
- **DDI** clones those sectors of the source HDD which have been read during data recovery. Such readings are optimized to minimize the movement of the drive's head unit. All following reads from those sectors will be done from the clone disk. For example, if files are to be recovered from a partition on the drive, **DDI** will clone the boot record of the drive, the file table of the partition, and the sectors of the files. If the partition is scanned, the scanned sectors will be cloned, too. All consecutive operations, such as file preview, and so on, will be done from the clone disk. This greatly reduces the time necessary to perform the recovery operations and furthermore hard disk wear.

DeepSpar Disk Imager™ board
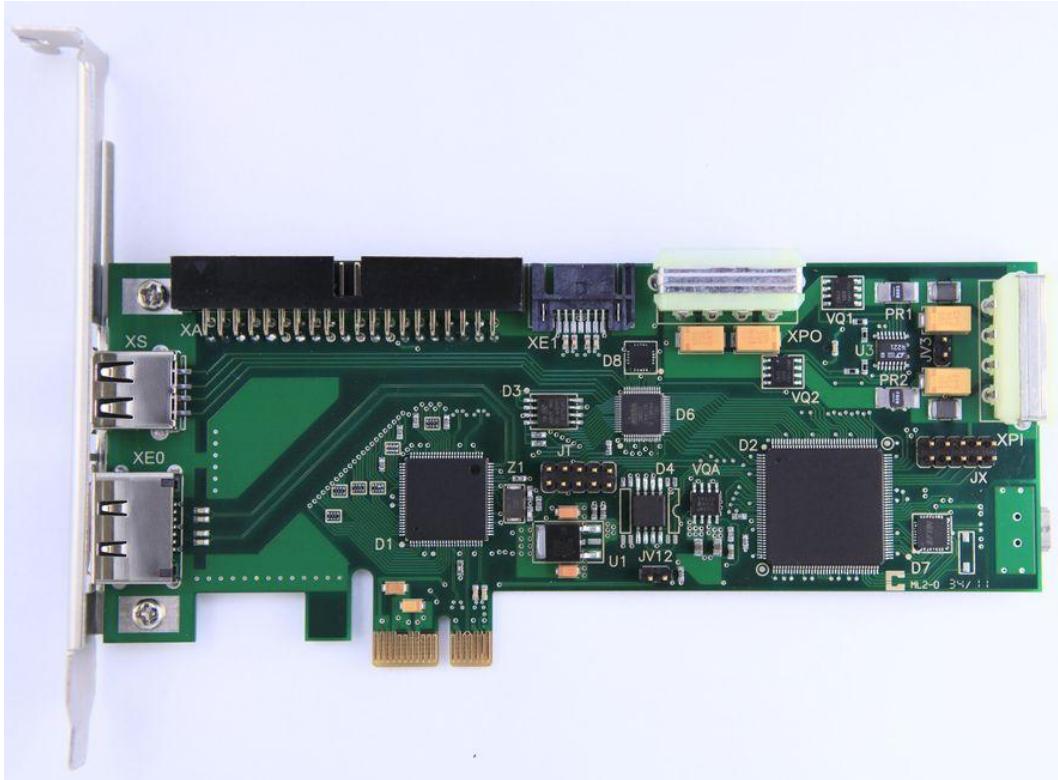
Read the **DDI** documentation on how to install **DDI** connect the drives to **DDI** and start working with it.

The **DDI** board should be installed into a separate network computer (the **DDI computer**), and the source and clone drives should be connected to it. The DDI computer should be started using the boot USB stick supplied with the board. **R-Studio** running on another computer (the **R-Studio computer**) accesses the disk via the network. All data recovery operations will be done through this setup:
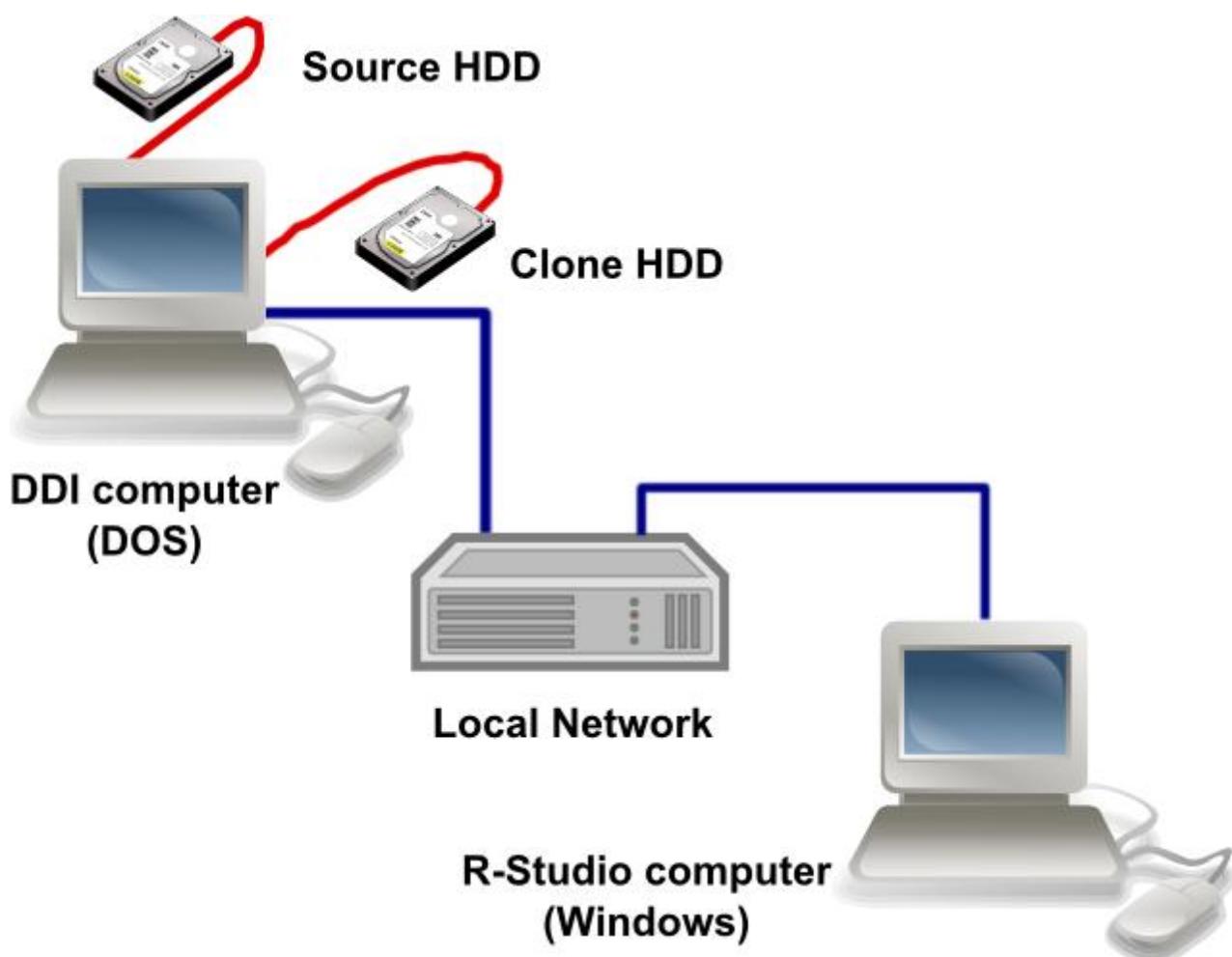
There may be several **DDI computers** on the network, **R-Studio** will connect to all of them. Such configuration may be useful for RAID recovery when several disks on the RAID have hardware problems.

Working with DDI

To start working with **DDI**, its computer should be connected to **R-Studio**.

To connect R-Studio to the DDI computer,

* **Select Connect to DDI on the Drive menu**

> **The disks connected to DDI will appear on the Drive pane.**

Now it is possible to work with disks connected to **DDI** like all other disk objects on the **Drive** panel. For example, such disks may be included into virtual RAIDs and other compound objects.

Viewing the drive map

A drive map shows the conditions for individual disk sectors. You may see which sectors are OK, bad, or unstable.

To view the drive map,

*   **Right-click the required hard drive/partition and select Show drive map... on the shortcut menu,**

or

select the object and select **Show drive map...** on the **Create** menu

>   **The drive map will appear in the right tab.**

DDI Drive Map **tab**

Drive map controls

Sectors	The number of the first sector in the row.
Offset	Offset in the data. Enter the address you want to jump to and press the **Enter** key.
Sectors/Bytes/KB...	Specifies the dimension of the data in the **Offset** field.
Previous/Next	Moves to the previous/next part of the data.
+/-	Zooms into/out of, the data.

To see more detailed information about a particular sector range, right click the corresponding rectangle and select **Information** on the shortcut menu.

Block information **dialog box**

Click the **Open in Hex Editor** button to open the selected block in the **Text/hexadecimal editor**.

Cloning file sectors

You may clone separate files when necessary.

To clone sectors of a single file,

* **Right-click the file and select Clone file sectors on the shortcut menu.**
   or
   select the file and select **Clone file sectors** on the **File** menu

> **The file sectors will be cloned and R-Studio will show their status in the** Contents **pane.**

To clone sectors of several files,

* **Mark the files, right-click them, and select Clone marked file sectors on the shortcut menu.**

> **The file sectors will be cloned and R-Studio will show their status in the** Contents **pane.**

Sector status

OK	Read without errors
B	Bad
C	Corrupted. At least one sector hasn't been read.
Unprocesse	At least one sector isn't cloned yet.
d	

Viewing the file map

A file map shows the conditions for individual file sectors. You may see which sectors are OK, bad, or unstable.

To view the file map,

*   **Right-click the required file and select Map of file... on the shortcut menu,**

>   **The file map will appear in the lower pane.**

DDI File Map **pane**

Drive map controls

Sectors	The number of the first sector in the row.
Offset	Offset in the data. Enter the address you want to jump to and press the **Enter** key.
Sectors/Bytes/KB…	Specifies the dimension of the data in the **Offset** field.
Previous/Next	Moves to the previous/next part of the data.
+/-	Zooms into/out of, the data.

To see more detailed information about a particular sector range, right click the corresponding rectangle and select **Information** on the shortcut menu.

Block information **dialog box**

Click the **Open in Hex Editor** button to open the selected block in the **Text/hexadecimal editor**.

VI   R-Studio Emergency

R-Studio Emergency is a tool that allows you to startup a computer with a damaged startup disk and recover data stored on its hard drives. Then restored data can either be saved on its disk or transferred to a working computer via a network.

The R-Studio Emergency version is a part of the R-Studio software package.

You may run this R-Studio Emergency version on a computer for which you have bought an R-Studio license, and you may not transfer the licensed software to another computer.

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6.1 Contact Informaiton and Technical Support

To obtain the latest version of **R-Studio Emergency**, go to:

Product Site: http://www.r-tt.com
Sales Department: sales@r-tt.com

R-Studio Technical Support Team is available 24 hours a day, seven days a week, and has an average response time less than 4 hours.

Tech. Support: support@r-tt.com
Send your support request to: http://www.r-tt.com/Support_request.html

6.2 Installing R-Studio Emergency Startup Media Creator

Attention Windows NT/2000/XP/2003/Vista/2008/7 users! You must have administrative privileges to install R-Studio Emergency Startup Media Creator.

If you are not sure whether you have such privileges, you almost certainly do not have them. Contact your system administrator for assistance.

1. Run the setup file.
2. Follow the on-screen instructions.

You may create startup disks even before the installation ends.

6.3 Creating Startup Disks

You need to create either

- A startup CD/DVD disc. You may create an ISO image, or write the disc directly from **R-Studio** Emergency Startup Media Creator, if there is a CD/DVD recorder in your system.

   or

- A startup FAT/FAT32 removable device recognized by your system as a bootable one. The total available size of the device should be more than 50 MB.

   or

- 5 floppy disks.

Check the Hardware Compatibility List.

If you have problems with starting you computer up from the **R-Studio** Emergency startup disks, select **Configure startup media troubleshooting options** on the Startup media type selection dialog box. Then the Startup Media Troubleshooting Options dialog box will appear. You may configure these options to eliminate those problems.

When **R-Studio Emergency Startup Media Creator** starts, its Welcome dialog box appears:

Welcome to **R-Studio** Emergency Startup Media Creator **dialog box**

Welcome **dialog box**

click the **Next** button to see the list of all devices on which startup disks may be created.

Startup media type selection **dialog box**
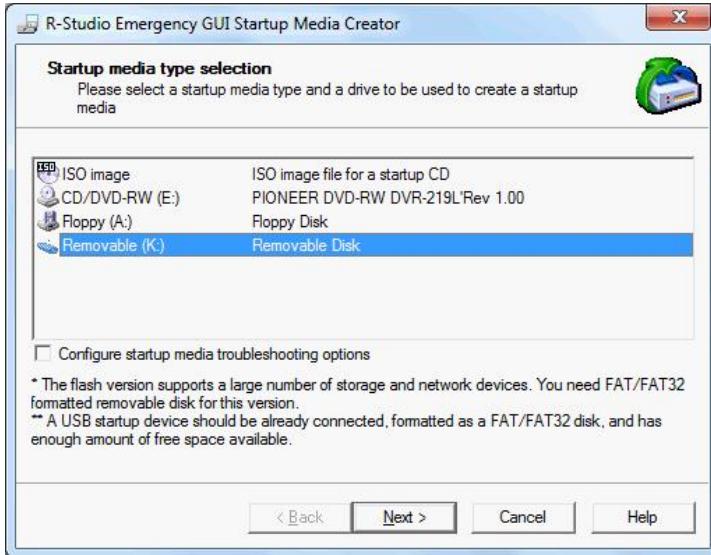
To create a startup CD/DVD disc directly on your CD/DVD writer (if present):

1 Run **R-Studio Emergency**

2 **Select the CD/DVD writer on the** Startup media type selection **dialog box and click the Next button**

3 **Read and accept the License Agreement and enter the registration key on the** R-Studio Emergency **Activation** **dialog box and click the Next button**

R-Studio Emergency Activation **dialog box**
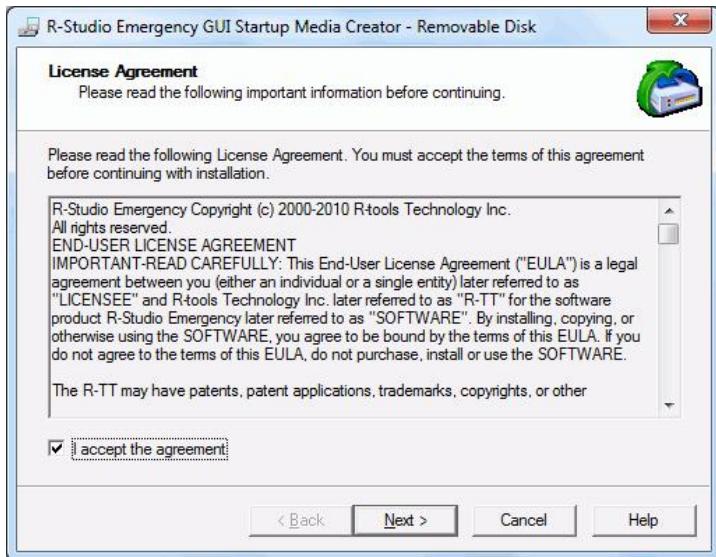
4 **Insert a blank CD/DVD disk into the CD/DVD recorder and click the Next button**

Insert a CD/DVD disc **dialog box**
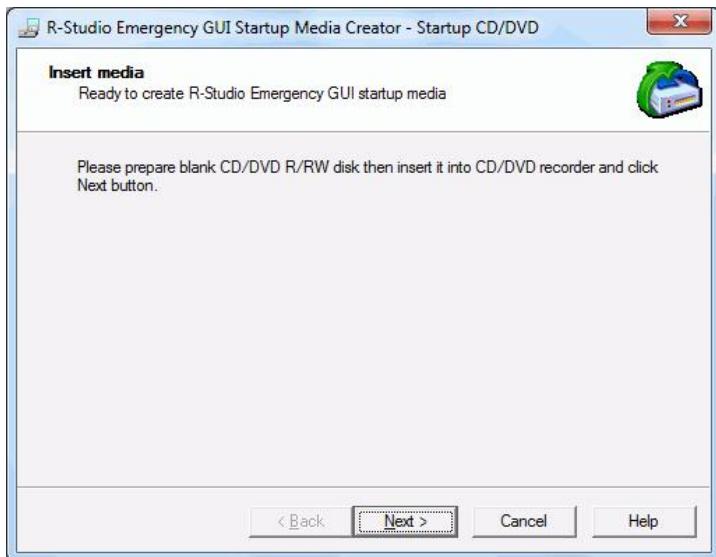
> **R-Studio Emergency Startup Media Creator will start creating the startup CD/DVD disc showing the progress on the** Creating startup media **dialog box**

Creating startup media **dialog box**
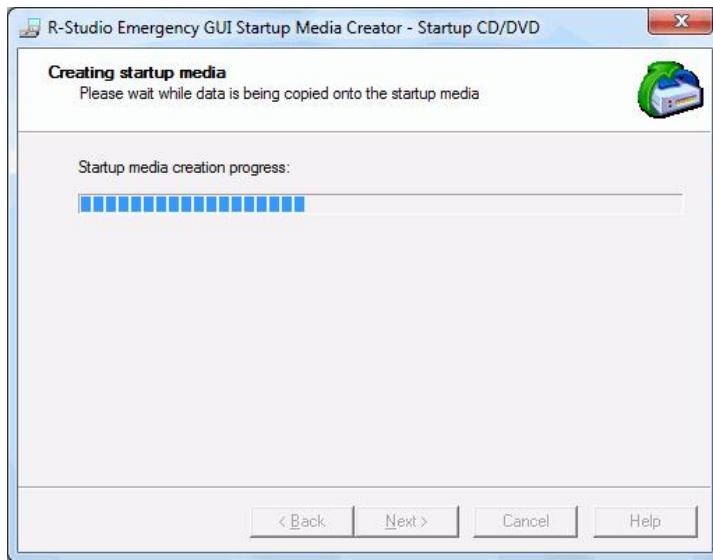
When R-Studio Emergency Startup Media Creator finishes creating the startup CD/DVD disc, the R-Studio Emergency Startup Media Creation is Finished **message will appear**
You may either exit **R-Studio Emergency Startup Media Creator** by clicking the **Finish** button or create another startup media by clicking the **Back** button.

R-Studio Emergency Startup Media Creation is Finished **message**

To create an ISO image of a startup CD/DVD disc

1   Run **R-Studio Emergency**

2   **Select ISO Image for a startup CD/DVD on the R-Studio** Emergency Startup Media Creator **dialog box and click the Next button**

3 **Read and accept the License Agreement and enter the registration key on the R-Studio** Emergency Activation **dialog box and click the Next button**

4 **Select a place and file name for the ISO image of the startup CD/DVD and click the Save button**

> **When R-Studio Emergency Startup Media Creator finishes writing the file with the ISO image, the R-Studio** Emergency Startup Media Creation is Finished **message will appear**

You may either exit **R-Studio Emergency Startup Media Creator** by clicking the **Finish** button or create another startup media by clicking the **Next** button.

R-Studio Emergency Startup Media Creation is Finished **dialog box**
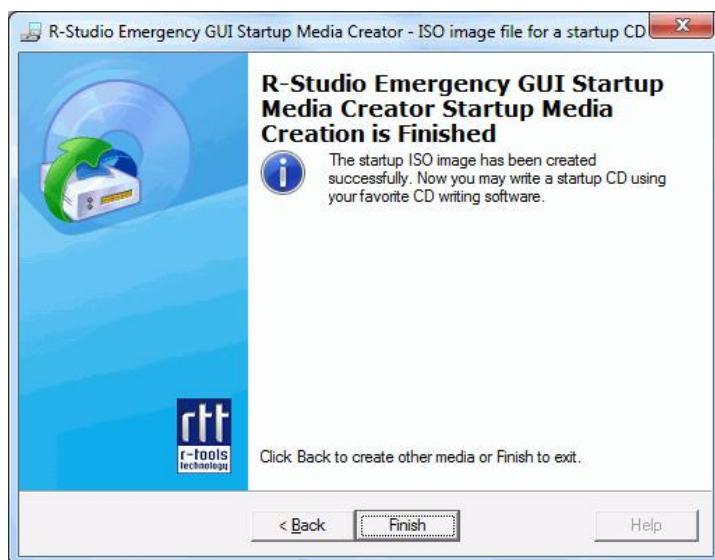
5 **Create the startup CD/DVD using your favorite CD/DVD creation software**

Load the created ISO image into the CD/DVD creation software. Consult documentation for the software for details.

To create a startup FAT/FAT32 removable device

1 **Run R-Studio Emergency**

2 **Select the removable device on the** Startup media type selection **dialog box and click the Next button**

3 **Read and accept the License Agreement and enter the registration key on the R-Studio** Emergency Activation **dialog box and click the Next button**

4 **Check that the FAT/FAT32-formatted device is ready and click the Next button**

Ready to create startup media **dialog box**

> **R-Studio Emergency Startup Media Creator** **will start creating the startup USB disk showing the progress on the** Creating startup media **dialog box**

When **R-Studio Emergency Startup Media Creator** **finishes creating the startup device, the R-Studio** Emergency Startup Media Creation is Finished **message will appear**
You may either exit **R-Studio Emergency Startup Media Creator** by clicking the **Finish** button or create another startup media by clicking the **Next** button.

R-Studio Emergency Startup Media Creation is Finished **dialog box**

To create floppy disks:

You will need 5 floppy disks.

1 **Run R-Studio Emergency**

2 **Select Floppy Disk for the startup floppy disks on the R-Studio** Emergency Startup Media Creator **dialog box and click the Next button**

3 **Read and accept the License Agreement and enter the registration key on the R-Studio** Emergency Activation **dialog box and click the Next button**

4 **Insert the first floppy disk and click the Next button on the** Ready to create startup media **dialog box**

R-Studio Emergency Startup Media Creation- Floppy Disk **message**
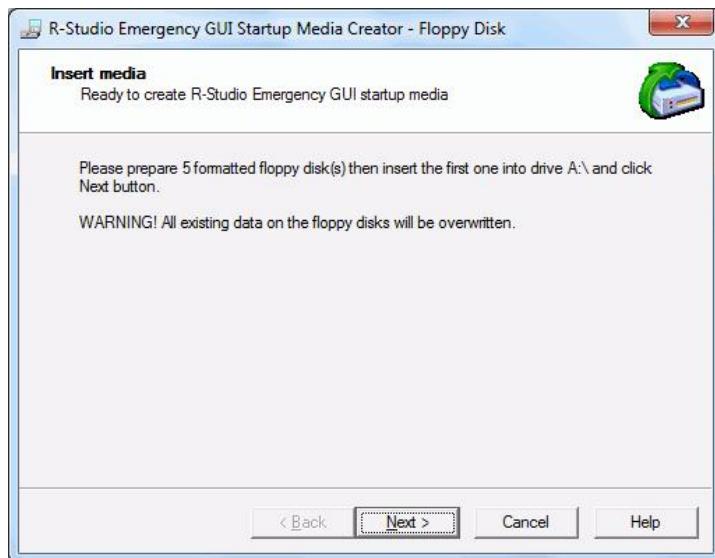
> **R-Studio Emergency Startup Media Creator will start creating the first startup floppy disk showing the progress on the** Creating startup media **dialog box**

5 **Insert the second floppy disk and click the OK button when the** Please insert formatted diskette #2 into drive A: **message will appear**

> **When R-Studio Emergency Startup Media Creator finishes creating the second startup floppy disk, the R-Studio** Emergency Startup Media Creation is Finished **message will appear**

You may either exit **R-Studio Emergency Startup Media Creator** by clicking the **Finish** button or create another startup media by clicking the **Next** button.

R-Studio Emergency Startup Media Creation is Finished **message**

Startup Media Troubleshooting Options

Those options will help you if you have problems with starting you computer up from the **R-Studio**startup disks. Please, contact the **R-Studio Technical Support Team** for more information.

R-Studio Startup Media Troubleshooting Options **dialog box**
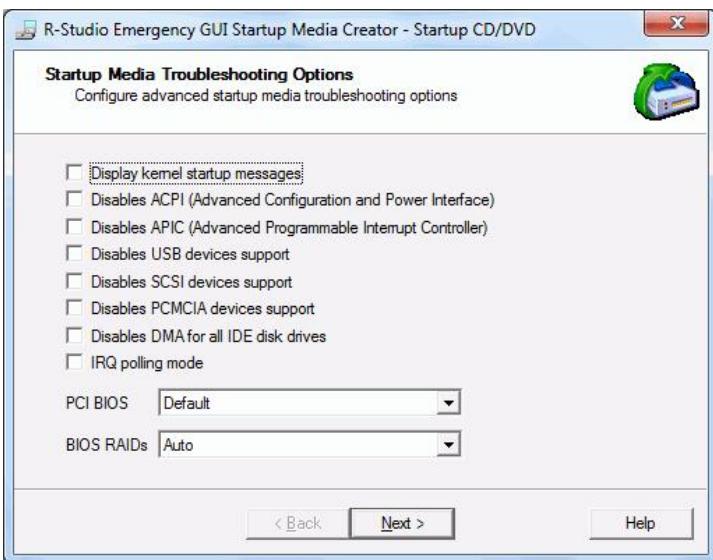
Display kernel startup messages	if this checkbox is enabled, **R-Studio** Emergency displays all startup messages. That may be useful to locate the source of the problem when your system hangs during **R-Studio** Emergency startup.
Disables ACPI Disables APIC	Select these checkboxes when your system detects some hardware incorrectly during **R-Studio** Emergency startup and displays messages like: `hda: lost interrupt`
Disables USB device support	Select this checkbox if your system experiences problems with USB devices during **R-Studio** Emergency startup.

Disables SCSI device support	Select this checkbox if your system experiences problems with SCSI devices during **R-Studio** Emergency startup.
Disables PCMCIA device support	Select this checkbox if your system experiences problems with PCMCIA devices during **R-Studio** Emergency startup.
Disables DMA for all IDE disk drives	Select this checkbox if your system experiences problems with IDE disks during **R-Studio** Emergency startup.
IRQ polling mode	Select this checkbox to enable the IRQ polling mode to prevent locking the system because a device generates too much interrupts for the system to handle.
PCI BIOS	Select an appropriate option if your system experiences problems with PCI cards.
BIOS RAIDS	Select an appropriate option if your system experiences problems with RAIDs built in the system board.

6.4   R-Studio Emergency Operation

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6.4.1   Starting a Computer with the R-Studio Emergency Startup Disks

We recommended that you print out this help page and have the hardcopy on hand while you are performing this action.

If there is a non-IDE disk controller in your system, or you plan to use network disks or external hardware devices, first check the Hardware Compatibility List.

If you plan to use any external device, turn it on before starting the system.

If the motherboard in your computer supports the Serial ATA (SATA) devices, but IDE disks are also present, only the SATA devices should be set to the Enhanced Mode in BIOS.

To start the computer with the R-Studio Emergency startup CD/DVD disc or any removable device,

1   **Make sure that the first startup device in the system BIOS is the CD/DVD drive or the removable device**
     Refer to your system documentation for details.

2 **Insert the R-Studio Emergency startup CD/DVD disc and start your computer**

> **R-StudioEmergency will start and its** Device/Disk **panel will appear**

To start the computer with the R-Studio Emergency startup floppy disks,

1 **Make sure that the first startup device in the system BIOS is A (Floppy)**
Refer to your system documentation for details.

2 **Insert the first startup floppy disk and start your computer**

> **The following text will appear on the screen:**

```
Loading
Uncompressing ... OK, starting the kernel
VFS: Insert the second boot disk and press ENTER
```

3 **Insert the second disk and press ENTER.**

> **R-Studio Emergency will start and its** Device/Disk **panel will appear**

6.4.2 File Recovery

To recover files,

1 **Select a partition on the** Device/Disk **panel on which the files to recover reside and press the Enter key**

> **R-Studiowill change its panel showing the disk's folders/files structure**

2 **Select the file to recover on the** Files View **panel. Use the** Tab **key to switch between panes**

3 **Press the F2 key and specify the output folder on the Recover dialog box**
External USB drives with the NTFS file system: **R-Studio Emergency** can save recovered files on such disks if they are properly disconnected in a Windows system using the **Safely Remove Hardware** icon in the system tray or while shutting Windows down.

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Mapping Network Drives
Viewing object properties

6.4.3 Searching for a File

To search for a file,

1 **Select Find on the Tools menu (or press the Alt+F key)**

2 **Specify a file name or mask**
Look at dialog box

Deleted files:	If it is selected, **R-Studio** makes a search among deleted files/folders.
Existing files:	If it is selected, **R-Studio** makes a search among existing files/folders.
Files:	If it is selected, **R-Studio** includes files into a search.
Folders:	If it is selected, **R-Studio** includes folders into a search.

To find the next file corresponding to the specified file mask,

* **Press the Alt+N key**

6.4.4 Disk Scan

To scan an object

1 **Select an object on the** Device/Disk **panel and press the F6 key**

2 **Specify the required parameters on the** Scan **dialog box and press the Enter key**

Scan dialog box

Start:	Sets the start point of the area to be scanned.
Size:	Sets the size of the area to be scanned.
Numbers in these fields can be in bytes or sectors. If no letters are after the numbers, **R-Studio**assumes the numbers in bytes. The following case-ignoring notation is possible:	
b	Bytes
kb	Kilobytes
mb	Megabytes
gb	Gigabytes
tb	Terabytes

> **When an object is scanned, it may be searched for files, and found files may be recovered the same way as for a regular object**

Found objects:

Extra Found Files	Entries of known file types have been found
Recognized1	Records and file entries are found for this partition
Recognized2	Only file entries are found for this partition
Recognized3	Only boot records are found for this partition

To save scan information

1 **Select an object with scan information**

2 **Press the Alt+D key and select Save Scan Information on the Drive menu**

3 **Specify the output folder and file name on the** Save Scan Information **dialog box**

Mapping Network Drives

To open scan information

1 **Select an object to which scan information is to be opened**

2 **Press the Alt+D key and select Open Scan Information on the Drive menu**

3 **Specify the folder and file name with the scan information on the** Open Scan Information **dialog box**

Mapping Network Drives

To delete scan information

1 **Select an object to which scan information is to be deleted**

2 **Press the Alt+D key and select Delete Scan Information on the Drive menu**

6.4.5 Disk Images

To create an image file

1 **Select an object on the** Device/Disk **panel**

2 **Press the Alt+D key and select Create Plain Image File or Create Compressed Image File on the Drive menu**

Plain Image
If this option is selected, **R-Studio** will create a simple exact copy of the object. This image format is compatible with the previous versions of **R-Studio**.

Compressed Image
If this option is selected, **R-Studio** will create an image file compatible with the images created by **R-Drive Image**, but incompatible with the previous versions of **R-Studio**.

3 **Specify the output folder and file name on the** Create Image File **dialog box**

Mapping Network Drives

To load an image file

1 **Press the Alt+D key and select Open Image File on the Drive menu**

2 **Specify the folder and file name with the image on the** Open Image File **dialog box**

Mapping Network Drives

6.5 R-Studio Emergency Technical Information

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6.5.1   Properties and Text/Hexadecimal Viewer

To view object properties,

1   Select an object

2   Press the F7 key

To view an object

1   Select an object

2   Press the F3 key

3   Press the **F6** key to view and select file attributes
Press the **Esc** key to close the viewer.

6.5.2   Network Drives

To map a network drive,

1   On a dialog box with Map Network Drive, press the Alt+M key

>   The Querying DHCP **message will appear**
If the network has a DHCP server, the computer will obtain an IP address automatically. A list of adapters and their IP addresses will appear on the Network Adapters dialog box.

If the network does not have a DHCP server, select a network adapter on the Network Adapters dialog box and press the **F4** key. Enter the IP address and network mask and press the **Enter** button.

2   Select a configured network adapter and press the Enter key

3   Enter the required information on the Map Network Drive **message message**

Server IP Address:	IP address of the computer where the network drive is to reside.
Server Share Name:	Name of the shared folder where the network drive is to reside.
Login:	Username of a user on the computer where the network drive is to reside.
Password:	User's password on the computer where the network drive is to reside.

>   The mounted network disk will appear

To disconnect a mounted network drive

1   Select a mounted network drive

2   Switch to the Disconnect button and press the Enter key

6.5.3   Log

To clear log information

*   Select Clear Log on the Tools menu

To save log information to a file

*   Select Save Log To File on the Tools menu

6.6 R-Studio Emergency Hardware Compatibility List

R-Studio Emergency supports the following hardware devices:

Data Storage Devices

Serial ATA and Parallel ATA drivers

ACPI firmware driver for PATA
AHCI SATA
ALi PATA
AMD/NVidia PATA
ARTOP 6210/6260 PATA
ARTOP/Acard ATP867X PATA
ATI PATA
CMD / Silicon Image 680 PATA
CMD640 PCI PATA
CMD64x PATA
CS5510/5520 PATA
CS5530 PATA
CS5535 PATA
CS5536 PATA
Compaq Triflex PATA
Cypress CY82C693 PATA
EFAR SLC90E66
Generic ATA
HPT 343/363 PATA
HPT 366/368 PATA
HPT 370/370A/371/372/374/302 PATA
HPT 372N/302N PATA
IT8211/2 PATA
IT8213 PATA
Initio 162x SATA
Intel ESB, ICH, PIIX3, PIIX4 PATA/SATA
Intel PATA MPIIX
Intel PATA old PIIX
Intel SCH PATA
JMicron PATA
Legacy ISA PATA
Marvell PATA support via legacy mode
Marvell SATA
NETCELL Revolution RAID
NVIDIA SATA

Networking Devices

Ethernet (10 or 100Mbit)

3c501 `EtherLink`
3c503 `EtherLink II`
3c505 `EtherLink Plus`
3c507 `EtherLink 16`
3c509/3c529 (MCA)/3c579 `EtherLink III`
3c515 ISA `Fast EtherLink`
3c590/3c900 series (592/595/597) `Vortex/Boomerang`
3cr990 series `Typhoon`
AMD 8111 (new PCI lance)
AMD LANCE and PCnet (AT1500 and NE2100)
AMD PCnet32 PCI
AT1700/1720
Adaptec Starfire/DuraLAN
Ansel Communications EISA 3200
Apricot Xen-II on board Ethernet
Atheros L2 Fast Ethernet
Broadcom 440x/47xx ethernet
CS89x0
Cabletron E21xx
DECchip Tulip (dc2114x) PCI
Dave ethernet support (DNET)
Davicom DM910x/DM980x
Early DECchip Tulip (dc2104x) PCI
EtherExpress 16
EtherExpressPro support/EtherExpress 10 (i82595)
Generic DECchip & DIGITAL EtherWORKS PCI/EISA
HP 10/100VG PCLAN (ISA, EISA, PCI)
HP PCLAN (27245 and other 27xxx series)
HP PCLAN+ (27247B and 27252A)
ICL EtherTeam 16i/32
Intel(R) PRO/100+
LP486E on board Ethernet
Myson MTD-8xx PCI Ethernet

Nat Semi NS87410 PATA

Nat Semi NS87415 PATA

Ninja32/Delkin Cardbus ATA

OPTI FireStar PATA

OPTI621/6215 PATA

Older Promise PATA controller

PCMCIA PATA

Pacific Digital ADMA

Pacific Digital SATA QStor

Platform AHCI SATA

Promise PATA 2027x

Promise SATA SX4

Promise SATA TX2/TX4

QDI VLB PATA

RADISYS 82600 PATA

RDC PATA

SC1200 PATA

SERVERWORKS OSB4/CSB5/CSB6/HT1000 PATA

ServerWorks Frodo / Apple K2 SATA

SiS 964/965/966/180 SATA

SiS PATA

Silicon Image 3124/3132 SATA

Silicon Image SATA

ULi Electronics SATA

VIA PATA

VIA SATA

VITESSE VSC-7174 / INTEL 31244 SATA

Winbond SL82C105 PATA

Winbond W83759A VLB PATA

SCSI low-level drivers

3ware 5/6/7/8xxx ATA-RAID

3ware 97xx SAS/SATA-RAID

3ware 9xxx SATA-RAID

7000FASST SCSI

ACARD SCSI

ARECA (ARC11xx/12xx/13xx/16xx) SATA/ SAS RAID Host Adapter

Adaptec AACRAID

Adaptec AHA152X/2825

NE2000/NE1000

NI5010

NI5210

NI6510

National Semiconductor DP8381x series PCI Ethernet

OpenCores 10/100 Mbps Ethernet MAC

PCI NE2000 and clones support (see help)

RDC R6040 Fast Ethernet Adapter

RealTek RTL-8129/8130/8139 PCI Fast Ethernet Adapter

RealTek RTL-8139 C+ PCI Fast Ethernet Adapter

SEEQ8005

SMC 9194

SMC EtherPower II

SMC Ultra

SMSC LAN9420 PCI ethernet adapter

SiS 900/7016 PCI Fast Ethernet Adapter

Silan SC92031 PCI Fast Ethernet Adapter driver

Sun Cassini

Sun GEM

Sun Happy Meal 10/100baseT

Sundance Alta

TI ThunderLAN

ULi M526x controller

VIA Rhine

WD80*3

Winbond W89c840 Ethernet

Zenith Z-Note

nForce Ethernet

Ethernet (1000 Mbit)

Alteon AceNIC/3Com 3C985/NetGear GA620 Gigabit

Atheros L1C Gigabit Ethernet

Atheros L1E Gigabit Ethernet

Atheros/Attansic L1 Gigabit Ethernet

Broadcom CNIC

Broadcom NetXtremeII

Broadcom Tigon3

DL2000/TC902x-based Gigabit Ethernet

Adaptec AHA1542
Adaptec AIC79xx U320
Adaptec AIC7xxx
Adaptec AIC7xxx Fast -> U160
Adaptec AIC94xx SAS/SATA
Adaptec I2O RAID
AdvanSys SCSI
Always IN2000 SCSI
BusLogic SCSI
DMX3191D SCSI
DTC3180/3280 SCSI
EATA ISA/EISA/PCI (DPT and generic EATA/DMA-compliant boards)
Emulex LightPulse Fibre Channel Support
Future Domain 16xx SCSI/AHA-2920A
Generic NCR5380/53c400 SCSI MMIO
Generic NCR5380/53c400 SCSI PIO
HP Smart Array SCSI driver
HighPoint RocketRAID 3xxx/4xxx Controller
IBM Power Linux RAID adapter
IBM ServeRAID
Initio 9100U(W)
Initio INI-A100U2W
Intel/ICP (former GDT SCSI Disk Array) RAID Controller
LSI Logic Legacy MegaRAID Driver
LSI Logic Management Module
LSI Logic MegaRAID Driver
LSI Logic MegaRAID SAS RAID Module
LSI MPT Fusion SAS 2.0 Device Driver
Marvell 88SE64XX/88SE94XX SAS/SATA
NCR53c406a SCSI
PAS16 SCSI
PMC SIERRA Linux MaxRAID adapter
PMC-Sierra SPC 8001 SAS/SATA Based Host Adapter driver
Promise SuperTrak EX Series
QLogic ISP4XXX host adapter family
QLogic QLA2XXX Fibre Channel Support
Qlogic FAS SCSI
Qlogic QLA 1240/1x80/1x160 SCSI

IP1000 Gigabit Ethernet
Intel(R) 82575/82576 PCI-Express Gigabit Ethernet
Intel(R) 82576 Virtual Function Ethernet
Intel(R) PRO/1000 Gigabit Ethernet
Intel(R) PRO/1000 PCI-Express Gigabit Ethernet
JMicron(R) PCI-Express Gigabit Ethernet
National Semiconductor DP83820
New SysKonnect GigaEthernet
Packet Engines Hamachi GNIC-II
Packet Engines Yellowfin Gigabit-NIC
QLogic QLA3XXX Network Driver Support
Realtek 8169 gigabit ethernet
SiS190/SiS191 gigabit ethernet
SysKonnect Yukon2
VIA Velocity

Ethernet (10000 Mbit)

Broadcom NetXtremeII 10Gb
Chelsio 10Gb Ethernet
Chelsio Communications T3 10Gb Ethernet
Chelsio Communications T4 Ethernet
Cisco VIC Ethernet NIC Support
Intel(R) 10GbE PCI Express adapters
Intel(R) PRO/10GbE
Mellanox Technologies 10Gbit Ethernet
Myricom Myri-10G Ethernet
NetXen Multi port (1/10) Gigabit Ethernet NIC
Neterion X3100 Series 10GbE PCIe Server Adapter
QLOGIC QLCNIC 1/10Gb Converged Ethernet NIC Support
QLogic QLGE 10Gb Ethernet Driver Support
S2IO 10Gbe XFrame NIC
ServerEngines' 10Gbps NIC - BladeEngine
Solarflare Solarstorm SFC4000/SFC9000-family
Sun Neptune 10Gbit Ethernet
Tehuti Networks 10G Ethernet

Token Ring driver support

3Com 3C359 Token Link Velocity XL adapter
Generic TMS380 PCI
Generic TMS380 Token Ring ISA/PCI adapter
IBM Lanstreamer chipset PCI adapter

SYM53C8XX Version 2 SCSI

Symbios 53c416 SCSI

Tekram DC390(T) and Am53/79C974 SCSI

Tekram DC395(U/UW/F) and DC315(U) SCSI

Trantor T128/T128F/T228 SCSI

UltraStor 14F/34F

UltraStor SCSI

VMware PVSCSI driver

Workbit NinjaSCSI-32Bi/UDE

USB support

Cypress C67x00 HCD

Datafab Compact Flash Reader

Freecom USB/ATAPI Bridge

ISD-200 USB/ATA Bridge

ISP 1760 HCD

ISP116X HCD

ISP1362 HCD

Lexar Jumpshot Compact Flash Reader

OXU210HP HCD

Olympus MAUSB-10/Fuji DPC-R1

R8A66597 HCD

SL811HS HCD

SanDisk SDDR-09 (and other SmartMedia, including DPCM)

SanDisk SDDR-55 SmartMedia

USB 2.0

USB Mass Storage

USB Monitor

USBAT/USBAT02-based storage

xHCI HCD (USB 3.0)

Block devices

Compaq SMART2

Compaq Smart Array 5xxx

Mylex DAC960/DAC1100 PCI RAID Controller

Normal floppy disk

Promise SATA SX8

IEEE 1394 (FireWire) support

Legacy alternative FireWire driver stack

Storage devices (SBP-2 protocol)

IBM Olympic chipset PCI adapter

IBM Tropic chipset based adapter

Madge Smart 16/4 PCI Mk2

Proteon ISA

SMC ISA/MCA adapter

SysKonnect TR4/16 ISA

USB Network Adapters

ASIX AX88xxx Based USB 2.0 Ethernet Adapters

CDC EEM

CDC Ethernet support (smart devices such as cable modems)

Davicom DM9601 based USB 1.1 10/100 ethernet devices

GeneSys GL620USB-A based cables

Host for RNDIS and ActiveSync devices

MosChip MCS7830 based Ethernet adapters

NetChip 1080 based cables (Laplink, ...)

Prolific PL-2301/2302 based cables

SMSC LAN95XX based USB 2.0 10/100 ethernet devices

Sharp Zaurus (stock ROMs) and compatible

Simple USB Network Links (CDC Ethernet subset)

USB CATC NetMate-based Ethernet device

USB KLSI KL5USB101-based ethernet device

USB Pegasus/Pegasus-II based ethernet device

USB RTL8150 based ethernet device

PCMCIA network device support

3Com 3c574 PCMCIA
3Com 3c589 PCMCIA
Asix AX88190 PCMCIA
COM20020 ARCnet PCMCIA
Fujitsu FMV-J18x PCMCIA
NE2000 compatible PCMCIA
New Media PCMCIA
SMC 91Cxx PCMCIA
Xircom 16-bit PCMCIA

Other devices

Microsoft Hyper-V Utilities driver
Microsoft Hyper-V client drivers
Microsoft Hyper-V virtual block driver
Microsoft Hyper-V virtual network driver
Microsoft Hyper-V virtual storage driver

VII   R-Studio Agent Emergency

R-Studio Agent Emergency is a tool that allows you to start a network computer with a damaged startup disk and recover data stored on its hard drives. Then restored data can be transferred to a working computer via the network.

It works very simple: Just start the computer with the **R-Studio Agent Emergency** startup disk(s) and, if necessary, manually configure a network interface for **R-Studio Agent Emergency**. When started, the computer and its hard drives can be accessed by **R-Studio** installed on another computer on the network.

Contact Information and Technical Support
Installing R-Studio Agent Emergency Startup Media Creator
Creating Startup Disks
Starting a Computer with the R-Studio Agent Emergency Startup Disk

Hardware Compatibility List
   Disk Controllers
   Network Cards

7.1   Contact Information and Technical Support

To obtain the latest version of **R-Studio Agent Emergency**, go to:
   Product Site: http://www.r-tt.com
   Sales Department: sales@r-tt.com

R-Studio Technical Support Team is available 24 hours a day, seven days a week, and has an average response time less than 4 hours.
   Tech. Support: support@r-tt.com
   Send your support request to: http://www.r-tt.com/Support_request.html

7.2   Installing R-Studio Agent Emergency Startup Media Creator

Attention Windows NT/2000/XP/2003/Vista/2008/7 users! You must have administrative privileges to install R-Studio Agent Emergency Startup Media Creator.

If you are not sure whether you have such privileges, you almost certainly do not have them. Contact your system administrator for assistance.
   1. Run the setup file.
   2. Follow the on-screen instructions.
You may create startup disks even before the installation ends.

7.3   Creating Startup Disks

You need to create either

● A startup CD/DVD disc. You may create an ISO image, or write the disc directly from **R-Studio** Emergency Startup Media Creator, if there is a CD/DVD recorder in your system.

   or

● A startup FAT/FAT32 removable device recognized by your system as a bootable one. The total available

size of the device should be more than 10 MB.

or

- 4 formatted floppy disks

Check the [Hardware Compatibility List](#).

When **R-Studio Agent Emergency Startup Media Creator** starts, its Welcome dialog box appears:

Welcome to **R-Studio Agent** Emergency Startup Media Creator **dialog box**

Welcome **dialog box**

click the **Next** button to see the list of all devices on which startup disks may be created.

Startup media type selection **dialog box**
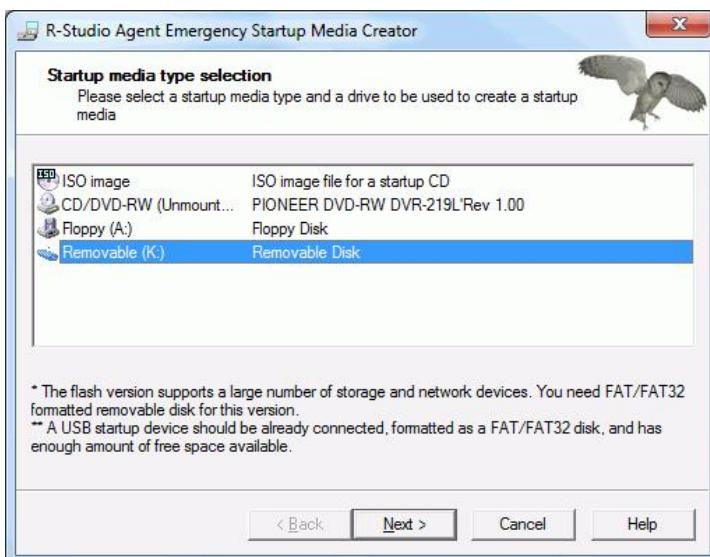
To create a startup CD/DVD disc directly on your CD/DVD writer (if present):

1   Run **R-Studio Agent Emergency**

2   **Select the CD/DVD writer on the** Startup media type selection **dialog box and click the Next button**

3 **Read and accept the License Agreement and enter the R-Studio Agent registration key on the R-Studio** Agent Emergency Activation **dialog box and click the Next button**

Note: You should enter the registration key of **R-Studio Agent**, not **R-Studio** itself.

R-Studio Agent Emergency License Agreement **dialog box**
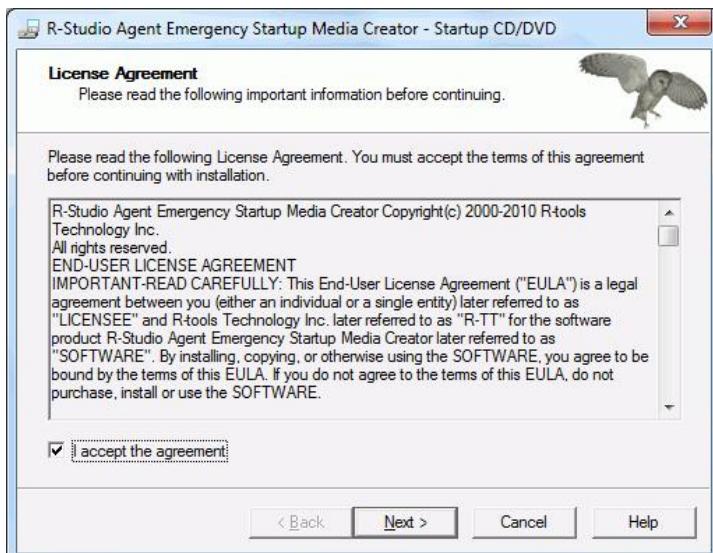
R-Studio Agent Emergency Activation **dialog box**
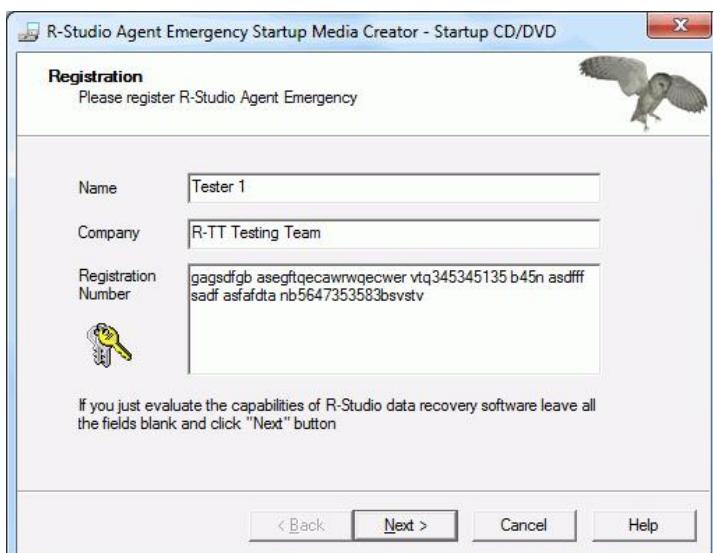
if you do not enter the registration key, **R-Studio Agent** Emergency will work in the Demo mode. You may enter the key later when **R-Studio Agent** Emergency and **R-Studio** establish a connection

4   Insert a blank CD/DVD disk into the CD/DVD recorder and click the Next button

Insert media disc **dialog box**
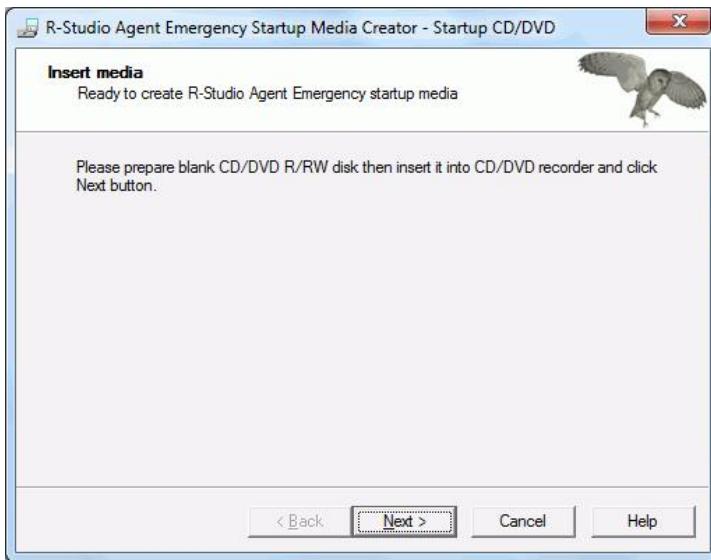
> **R-Studio Agent Emergency Startup Media Creator will start creating the startup CD/DVD disc showing the progress on the** Creating startup media **dialog box**

Creating startup media **dialog box**
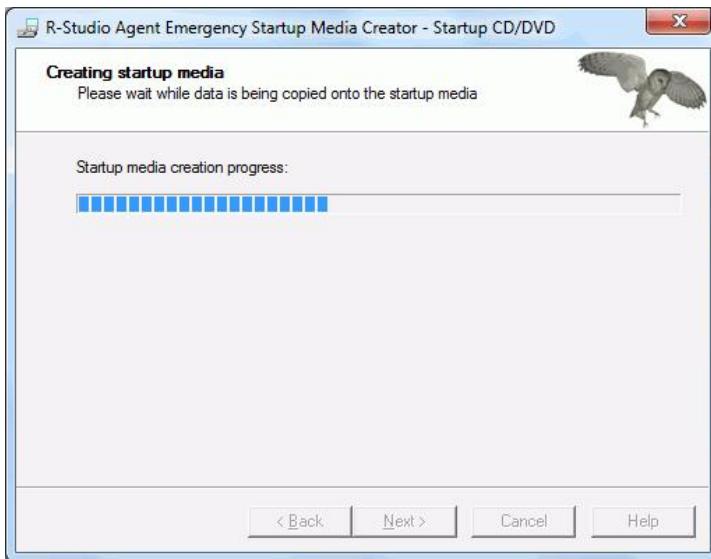
When R-Studio Agent Emergency Startup Media Creator finishes creating the startup CD/DVD disc, the R-Studio Agent Emergency Startup Media Creation is Finished **message will appear**

You may either exit **R-Studio Emergency Startup Media Creator** by clicking the **Finish** button or create another startup media by clicking the **Back** button.

R-Studio Agent Emergency Startup Media Creation is Finished **message**

To create an ISO image of a startup CD/DVD disc

1   **Run R-Studio Agent Emergency**

2   **Select ISO Image for a startup CD/DVD on the R-Studio** Agent Emergency Startup Media Creator **dialog box and click the Next button**

3   **Read and accept the License Agreement and enter the R-Studio Agent registration key on the R-Studio Agent** Emergency Activation **dialog box and click the Next button**

    Note: You should enter the registration key of **R-Studio Agent**, not **R-Studio** itself.

    if you do not enter the registration key, **R-Studio Agent** Emergency will work in the Demo mode. You may enter the key later when **R-Studio Agent** Emergency and **R-Studio** establish a connection.

4   **Select a place and file name for the ISO image of the startup CD/DVD and click the Save button**

>   **When R-Studio Bootable Startup Media Creator finishes writing the file with the ISO image, the R-Studio** Agent Emergency Startup Media Creation is Finished **message will appear**

    You may either exit **R-Studio Bootable Startup Media Creator** by clicking the **Finish** button or create another startup media by clicking the **Back** button.

R-Studio Agent Emergency Startup Media Creation is Finished **dialog box**

5 **Create the startup CD/DVD using your favorite CD/DVD creation software**

Load the created ISO image into the CD/DVD creation software. Consult documentation for the software for details.

To create a startup FAT/FAT32 removable device

1 Run **R-Studio Agent Emergency**

2 **Select the removable device on the** Startup media type selection **dialog box and click the Next button**

3 **Read and accept the License Agreement and enter the registration key on the R-Studio Agent** Emergency Activation **dialog box and click the Next button**

4 **Check that the correct FAT/FAT32-formatted device is selected and click the Next button**

Confirm device selection **dialog box**
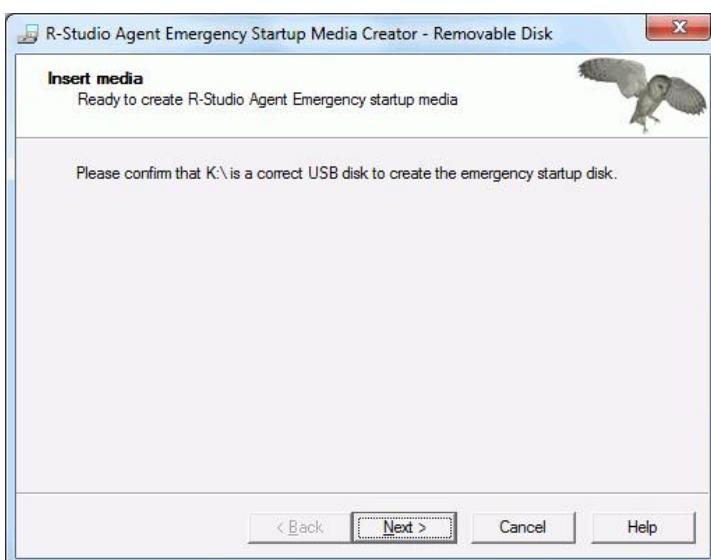
> **> R-Studio Agent Emergency Startup Media Creator will start creating the startup USB disk showing the progress on the** Creating startup media **dialog box**

When R-Studio Agent Emergency Startup Media Creator finishes creating the startup device, the R-Studio Agent Emergency Startup Media Creation is Finished **message will appear**
You may either exit **R-Studio Emergency Startup Media Creator** by clicking the **Finish** button or create another startup media by clicking the **Back** button.

R-Studio Agent Emergency Startup Media Creation is Finished **dialog box**
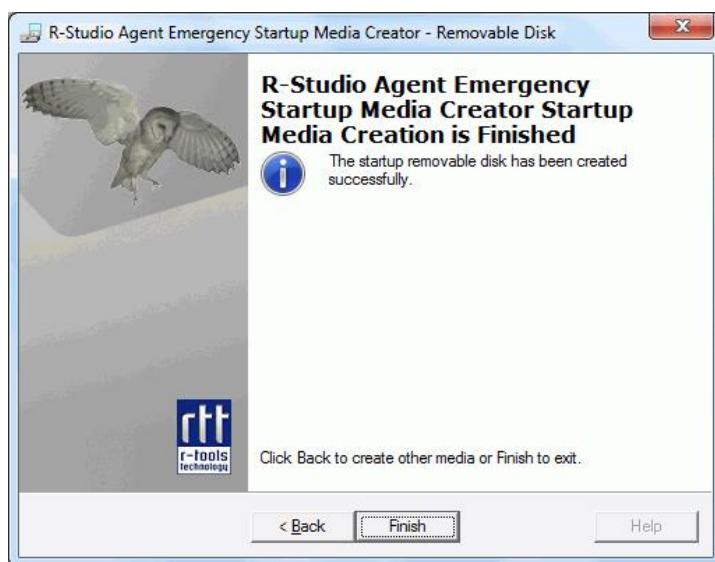
To create floppy disks:
You will need 4 formatted floppy disks.

1   Run R-Studio Agent Emergency

2   Select Floppy Disk for the startup floppy disk on the R-Studio Agent Emergency Startup Media Creator **dialog box and click the Next button**

3   Enter the registration information and number on the Registration **dialog box and click the Next button**
If you leave all the field blank, **R-Studio Agent Emergency** will work with the **Demo-version limitations**

4 **Insert the floppy disk and click the Next button on the** Insert floppy **dialog box**

Insert floppy **dialog box**
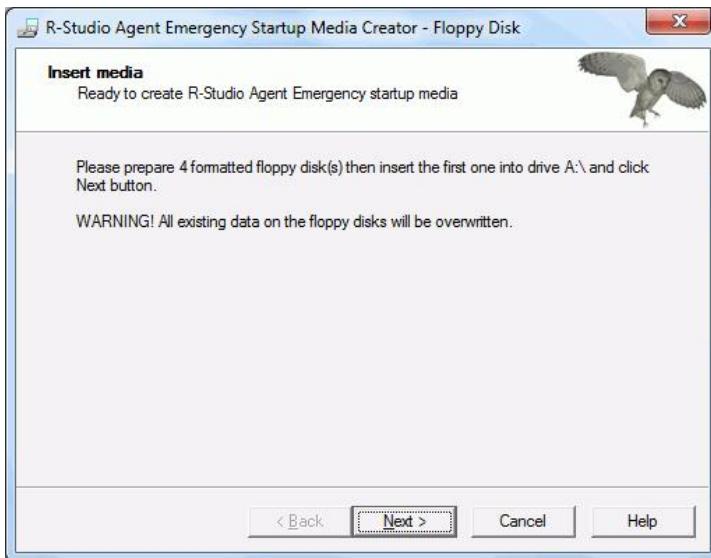
> **R-Studio Agent Emergency Startup Media Creator** will start creating the startup floppy disk **showing the progress on the** Creating startup media **dialog box**

Creating startup media **dialog box**
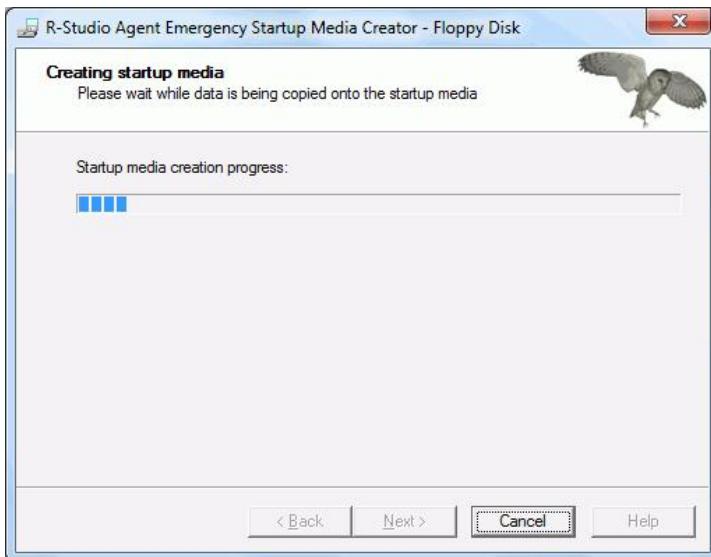
5 **Insert the second floppy disk and click the OK button when the** Please insert formatted diskette #2 into drive A: **message will appear**
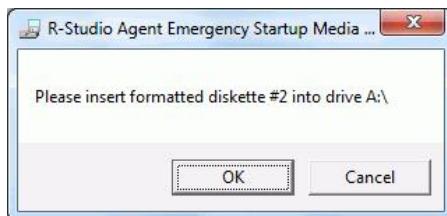
Do it with the next 2 floppy disks.

> When **R-Studio Startup Media Creator** finishes creating the startup floppy disk, the **R-Studio** Agent Emergency Startup Media Creation is Finished **message will appear. You may either exit R-Studio Startup Media Creator by clicking the Finish button or create another startup media by clicking the Back button.**

R-Studio Agent Emergency Startup Media Creation is Finished **dialog box**

7.4 Starting a Computer with the R-Studio Agent Emergency Startup Disk

We recommended that you print out this help page and have the hardcopy on hand while you are performing this action.

Before you start the computer you should be aware that your network has a DHCP server or you know the computer's IP address and network mask.

If there is a non-IDE disk controller in your system, or you plan to use network disks or external hardware devices, first check the **Hardware Compatibility List**.

If you plan to use any external device, turn it on before starting the system.

If the motherboard in your computer supports the Serial ATA (SATA) devices, but IDE disks are also present, only the SATA devices should be set to the Enhanced Mode in BIOS.

To start the computer with the R-Studio Agent Emergency startup disks

1 **Make sure that the first startup device in the system BIOS is the device from which you plan to start your computer (a CD/DVD drive or A (Floppy))**

Refer to your system documentation for details.

2 **Insert the R-Studio Agent Emergency startup CD/DVD disc, a removable device, or the first floppy disk and start your computer**

> **R-Studio Agent Emergency will start and its prompt will appear**

If you start your computer with floppy disks, you'll see prompts to insert a next floppy disk.

```
----------------------------------------------------
 Booting R-Studio Emergency. Please wait...
 Waiting 8 seconds for PCMCIA devices to settle
```

```
Booting R-Studio Agent Emergency. Now you may remove floppy.
-------------------------------------------------------------
Querying DHCP to configure network interfaces...
Press ENTER within 10 seconds to configure them manually.
```

If your network has a DHCP server

The computer running R-Studio Agent Emergency will be assigned an IP address automatically

A prompt with a computer address will appear. You need to remember it to access the computer via network.

If your network does not have a DHCP server

You need to configure the interfaces and IP addresses manually.

1. A prompt to select an interface will appear. Enter the selected interface name and press **Enter**.
2. A prompt to enter its IP address and optional subnet mask will appear. Enter the IP address and optional subnet mask and press **Enter**.

```
----------------------[ List of
Interfaces ]------------------------------
Name            IP Address           NETMASK          Vendor
-----------------------------------------------------------------
------------
re0             Unconfigured                          RealTek
8139C+
-----------------------------------------------------------------
------------
# Enter interface name, 'gw' for default gateway or just press
ENTER to finish
#>re0
# Enter IP address and optional NETMASK delimited by space
#>192.168.0.10 255.255.255.0
```

3. A prompt to configure another interface, gateway, or to finish configuring the interfaces will appear. Enter gw, enter the IP address of the gateway, and press **Enter**.

```
----------------------[ List of
Interfaces ]------------------------------
Name            IP Address           NETMASK          Vendor
-----------------------------------------------------------------
------------
re0             Unconfigured                          RealTek
8139C+
-----------------------------------------------------------------
------------
# Enter interface name, 'gw' for default gateway or just press
ENTER to finish
#>re0
# Enter IP address and optional NETMASK delimited by space
#>192.168.0.10 255.255.255.0

----------------------[ List of
Interfaces ]------------------------------
Name            IP Address           NETMASK          Vendor
-----------------------------------------------------------------
------------
```

```
re0              192.168.0.10        255.255.255.0       RealTek
8139C+
gw               Unconfigured                            Default
gateway
-----------------------------------------------------------------
------------
# Enter interface name, 'gw' for default gateway or just press
ENTER to finish
#>gw
# Enter default gateway IP Address
#>192.168.0.1


------------------------[ List of
Interfaces ]------------------------------
Name             IP Address          NETMASK             Vendor
-----------------------------------------------------------------
------------
re0              192.168.0.10        255.255.255.0       RealTek
8139C+
gw               192.168.0.1                             Default
gateway
-----------------------------------------------------------------
------------
# Enter interface name, 'gw' for default gateway or just press
ENTER to finish
#>
```

4. Press **Enter** to finish configuring the interfaces, or enter the name of the next interface to configure.

>   R-Studio Agent Emergency will show a prompt that is ready to accept connections

```
* R-Studio Agent started and ready to accept connections...
* You may press ENTER to start to remote R-Studio...
```

Now the computer may be accessed by **R-Studio** via network.

Starting a Connection from R-Studio Agent Emergency

When you need to connect **R-Studio** and **R-Studio Agent Emergency** over the Internet, it may be necessary to start the connection from the computer where **R-Studio Agent Emergency** is running.

To connect to R-Studio's computer,

1   Press the Enter key and enter the IP address of the computer where R-Studio is running as
`IPaddress:port`.

```
* R-Studio Agent started and ready to accept connections...
* You may press ENTER to start connection to remote R-Studio...
# Enter R-Studio IP address or just press ENTER to cancel>
192.168.0.25:80
```

The default port is 8080, and you don't have to specify it.

2   Enter the password if required, and press the Enter key.

```
* R-Studio Agent started and ready to accept connections...
* You may press ENTER to start connection to remote R-Studio...
# Enter R-Studio IP address or just press ENTER to cancel>
192.168.0.25:80
```

```
# Enter password or just press ENTER to connect without
one>PaSsWoRd1234
```

> When the connection is established successfully, **R-Studio Agent Emergency** will notify you about this.

```
* R-Studio Agent started and ready to accept connections...
* You may press ENTER to start connection to remote R-Studio...
# Enter R-Studio IP address or just press ENTER to cancel>
192.168.0.25:80
# Enter password or just press ENTER to connect without
one>PaSsWoRd1234
Connection with 192.168.0.25:80 is established successfully.
```

7.5   R-Studio Agent Emergency Hardware Compatibility List

[Disk Controllers](#)
[Network Cards](#)

[R-Studio Agent Emergency](#)
    [Contact Information and Technical Support](#)
    [Installing R-Studio Agent Emergency Startup Media Creator](#)
    [Creating Startup Disks](#)
    [Starting a Computer with the R-Studio Agent Emergency Startup Disk](#)

7.5.1   Disk Controllers

R-Studio Agent Emergency is based on the **FreeBSD 5.3** kernel and supports devices from the list published at http://www.freebsd.org/releases/5.3R/hardware-i386.html.

*: Supported in the floppy version

Disk controllers

IDE/ATA controllers (ata driver) *

The adapters supported by the aic driver include:
  Adaptec AHA-1505 (ISA)
  Adaptec AHA-1510A, AHA-1510B (ISA)
  Adaptec AHA-1520A, AHA-1520B (ISA)
  Adaptec AHA-1522A, AHA-1522B (ISA)
  Adaptec AHA-1535 (ISA)
  Creative Labs SoundBlaster SCSI host adapter (ISA)
  Adaptec AHA-1460, AHA-1460B, AHA-1460C, AHA-1460D (PC Card)
  Adaptec AHA-1030B, AHA-1030P (PC98)
  NEC PC-9801-100 (PC98)

The aha driver supports the following SCSI host adapters:
  Adaptec AHA-154xB
  Adaptec AHA-154xC
  Adaptec AHA-154xCF
  Adaptec AHA-154xCP
  Adaptec AHA-1640
  Adaptec AHA-174x in 154x emulation mode

DTC 3290 SCSI controller in 1542 emulation mode

Tekram SCSI controllers in 154x emulation mode

The ahb driver supports the following SCSI host adapters:

Adaptec AHA-1740

Adaptec AHA-1742

Adaptec AHA-1740A

Adaptec AHA-1742A

The ahc driver supports the following SCSI host adapter chips and SCSI controller cards:

Adaptec AIC7770 host adapter chip

Adaptec AIC7850 host adapter chip

Adaptec AIC7860 host adapter chip

Adaptec AIC7870 host adapter chip

Adaptec AIC7880 host adapter chip

Adaptec AIC7890 host adapter chip

Adaptec AIC7891 host adapter chip

Adaptec AIC7892 host adapter chip

Adaptec AIC7895 host adapter chip

Adaptec AIC7896 host adapter chip

Adaptec AIC7897 host adapter chip

Adaptec AIC7899 host adapter chip

Adaptec 274X(W)

Adaptec 274X(T)

Adaptec 284X

Adaptec 2910

Adaptec 2915

Adaptec 2920

Adaptec 2930C

Adaptec 2930U2

Adaptec 2940

Adaptec 2940J

Adaptec 2940N

Adaptec 2940U

Adaptec 2940AU

Adaptec 2940UW

Adaptec 2940UW Dual

Adaptec 2940UW Pro

Adaptec 2940U2W

Adaptec 2940U2B

Adaptec 2950U2W

Adaptec 2950U2B

Adaptec 19160B

Adaptec 29160B

Adaptec 29160N

Adaptec 3940

Adaptec 3940U
Adaptec 3940AU
Adaptec 3940UW
Adaptec 3940AUW
Adaptec 3940U2W
Adaptec 3950U2
Adaptec 3960
Adaptec 39160
Adaptec 3985
Adaptec 4944UW
NEC PC-9821Xt13 (PC-98)
NEC RvII26 (PC-98)
NEC PC-9821X-B02L/B09 (PC-98)
NEC SV-98/2-B03 (PC-98)
Many motherboards with on-board SCSI support

The ahd driver supports the following:
Adaptec AIC7901 host adapter chip
Adaptec AIC7901A host adapter chip
Adaptec AIC7902 host adapter chip
Adaptec 29320 host adapter
Adaptec 39320 host adapter
Many motherboards with on-board SCSI support

Controllers supported by the aac driver include:
Adaptec AAC-364
Adaptec SCSI RAID 2120S
Adaptec SCSI RAID 2130S
Adaptec SCSI RAID 2200S
Adaptec SCSI RAID 2410SA
Adaptec SCSI RAID 2810SA
Adaptec SCSI RAID 5400S
Dell CERC SATA RAID 2
Dell PERC 2/Si
Dell PERC 2/QC
Dell PERC 3/Si
Dell PERC 3/Di
Dell PERC 320/DC
HP NetRAID 4M

The adv driver supports the following SCSI controllers:
AdvanSys ABP510/5150
AdvanSys ABP5140
AdvanSys ABP5142
AdvanSys ABP902/3902
AdvanSys ABP3905
AdvanSys ABP915

AdvanSys ABP920
AdvanSys ABP3922
AdvanSys ABP3925
AdvanSys ABP930, ABP930U, ABP930UA
AdvanSys ABP960, ABP960U
AdvanSys ABP542
AdvanSys ABP742
AdvanSys ABP842
AdvanSys ABP940
AdvanSys ABP940UA/3940UA
AdvanSys ABP940U
AdvanSys ABP3960UA
AdvanSys ABP970, ABP970U
AdvanSys ABP752
AdvanSys ABP852
AdvanSys ABP950
AdvanSys ABP980, ABP980U
AdvanSys ABP980UA/3980UA
MELCO IFC-USP (PC-98)
RATOC REX-PCI30 (PC-98)
@Nifty FNECHARD IFC-USUP-TX (PC-98)

The adw driver supports SCSI controllers including:
AdvanSys ABP940UW/ABP3940UW
AdvanSys ABP950UW
AdvanSys ABP970UW
AdvanSys ABP3940U2W
AdvanSys ABP3950U2W

The bt driver supports the following BusLogic MultiMaster ``W'', ``C'', ``S'', and ``A'' series and compatible SCSI host adapters:
BusLogic BT-445C
BusLogic BT-445S
BusLogic BT-540CF
BusLogic BT-542B
BusLogic BT-542B
BusLogic BT-542D
BusLogic BT-545C
BusLogic BT-545S
BusLogic/BusTek BT-640
BusLogic BT-742A
BusLogic BT-742A
BusLogic BT-747C
BusLogic BT-747D
BusLogic BT-747S
BusLogic BT-757C
BusLogic BT-757CD

BusLogic BT-757D

BusLogic BT-757S

BusLogic BT-946C

BusLogic BT-948

BusLogic BT-956C

BusLogic BT-956CD

BusLogic BT-958

BusLogic BT-958D

Storage Dimensions SDC3211B / SDC3211F

AMI FastDisk Host Adapters that are true BusLogic MultiMaster clones are also supported by the bt driver.

The dpt driver provides support for the following RAID adapters:

DPT Smart Cache Plus

Smart Cache II (PM2?2?, PM2022 [EISA], PM2024/PM2124 [PCI]) (Gen2)

Smart RAID II (PM3?2?, PM3021, PM3222)

Smart Cache III (PM2?3?)

Smart RAID III (PM3?3?, PM3332 [EISA], PM3334UW [PCI]) (Gen3)

Smart Cache IV (PM2?4?, PM2042 [EISA], PM2044/PM2144 [PCI]) (Gen4)

Smart RAID IV

The adapters currently supported by the asr driver include the following:

Adaptec Zero-Channel SCSI RAID 2000S, 2005S, 2010S, 2015S

Adaptec SCSI RAID 2100S, 2110S

Adaptec ATA-100 RAID 2400A

Adaptec SCSI RAID 3200S, 3210S

Adaptec SCSI RAID 3400S, 3410S

Adaptec SmartRAID PM1554

Adaptec SmartRAID PM1564

Adaptec SmartRAID PM2554

Adaptec SmartRAID PM2564

Adaptec SmartRAID PM2664

Adaptec SmartRAID PM2754

Adaptec SmartRAID PM2865

Adaptec SmartRAID PM3754

Adaptec SmartRAID PM3755U2B / SmartRAID V Millennium

Adaptec SmartRAID PM3757

DEC KZPCC-AC (LVD 1-ch, 4MB or 16MB cache), DEC KZPCC-CE (LVD 3-ch, 64MB cache), DEC KZPCC-XC (LVD 1-ch, 16MB cache), DEC KZPCC-XE (LVD 3-ch, 64MB cache) -- rebadged SmartRAID V Millennium

The amr driver supports the following:

AMI MegaRAID 320-1

AMI MegaRAID 320-2

AMI MegaRAID 320-4X

AMI MegaRAID Series 418

AMI MegaRAID Enterprise 1200 (Series 428)

AMI MegaRAID Enterprise 1300 (Series 434)

AMI MegaRAID Enterprise 1400 (Series 438)
AMI MegaRAID Enterprise 1500 (Series 467)
AMI MegaRAID Enterprise 1600 (Series 471)
AMI MegaRAID Elite 1500 (Series 467)
AMI MegaRAID Elite 1600 (Series 493)
AMI MegaRAID Elite 1650 (Series 4xx)
AMI MegaRAID Express 100 (Series 466WS)
AMI MegaRAID Express 200 (Series 466)
AMI MegaRAID Express 300 (Series 490)
AMI MegaRAID Express 500 (Series 475)
Dell PERC
Dell PERC 2/SC
Dell PERC 2/DC
Dell PERC 3/DCL
Dell PERC 3/QC
Dell PERC 4/Di
HP NetRAID-1/Si
HP NetRAID-3/Si (D4943A)
HP Embedded NetRAID
Note: Booting from these controllers is supported. EISA adapters are not supported.

Controllers supported by the mlx driver include:

Mylex DAC960P
Mylex DAC960PD / DEC KZPSC (Fast Wide)
Mylex DAC960PDU
Mylex DAC960PL
Mylex DAC960PJ
Mylex DAC960PG
Mylex DAC960PU / DEC PZPAC (Ultra Wide)
Mylex AcceleRAID 150 (DAC960PRL)
Mylex AcceleRAID 250 (DAC960PTL1)
Mylex eXtremeRAID 1100 (DAC1164P)
RAIDarray 230 controllers, aka the Ultra-SCSI DEC KZPAC-AA (1-ch, 4MB cache), KZPAC-CA (3-ch, 4MB), KZPAC-CB (3-ch, 8MB cache)
All major firmware revisions (2.x, 3.x, 4.x and 5.x) are supported, however it is always advisable to upgrade to the most recent firmware available for the controller. Compatible Mylex controllers not listed should work, but have not been verified.
Note: Booting from these controllers is supported. EISA adapters are not supported.

Controllers supported by the mly driver include:

Mylex AcceleRAID 160
Mylex AcceleRAID 170
Mylex AcceleRAID 352
Mylex eXtremeRAID 2000
Mylex eXtremeRAID 3000
Compatible Mylex controllers not listed should work, but have not been verified.

The twe **driver supports the following ATA RAID controllers:**

AMCC's 3ware 5000 series
AMCC's 3ware 6000 series
AMCC's 3ware 7000-2
AMCC's 3ware 7006-2
AMCC's 3ware 7500-4LP
AMCC's 3ware 7500-8
AMCC's 3ware 7500-12
AMCC's 3ware 7506-4LP
AMCC's 3ware 7506-8
AMCC's 3ware 7506-12
AMCC's 3ware 8006-2LP
AMCC's 3ware 8500-4LP
AMCC's 3ware 8500-8
AMCC's 3ware 8500-12
AMCC's 3ware 8506-4LP
AMCC's 3ware 8506-8
AMCC's 3ware 8506-8MI
AMCC's 3ware 8506-12
AMCC's 3ware 8506-12MI

The twa **driver supports the following PATA/SATA RAID controllers:**

AMCC's 3ware 9500S-4LP
AMCC's 3ware 9500S-8
AMCC's 3ware 9500S-8MI
AMCC's 3ware 9500S-12
AMCC's 3ware 9500S-12MI

The ncr **driver provides support for the following NCR/Symbios SCSI controller chips:**

53C810
53C810A
53C815
53C820
53C825A
53C860
53C875
53C875J
53C885
53C895
53C895A
53C896
53C1510D

The following add-on boards are known to be supported:

I-O DATA SC-98/PCI (PC-98)
I-O DATA SC-PCI (PC-98)

The sym driver provides support for the following Symbios/LSI Logic PCI SCSI controllers:

53C810
53C810A
53C815
53C825
53C825A
53C860
53C875
53C876
53C895
53C895A
53C896
53C897
53C1000
53C1000R
53C1010-33
53C1010-66
53C1510D

The SCSI controllers supported by sym can be either embedded on a motherboard, or on one of the following add-on boards:

ASUS SC-200, SC-896
Data Technology DTC3130 (all variants)
DawiControl DC2976UW
Diamond FirePort (all)
I-O DATA SC-UPCI (PC-98)
Logitec LHA-521UA (PC-98)
NCR cards (all)
Symbios cards (all)
Tekram DC390W, 390U, 390F, 390U2B, 390U2W, 390U3D, and 390U3W
Tyan S1365

The following devices are currently supported by the ncv driver:

I-O DATA PCSC-DV
KME KXLC002 (TAXAN ICD-400PN, etc.), KXLC004, and UJDCD450
Macnica Miracle SCSI-II mPS110
Media Intelligent MSC-110, MSC-200
NEC PC-9801N-J03R
New Media Corporation BASICS SCSI
Qlogic Fast SCSI
RATOC REX-9530, REX-5572 (SCSI only)

Controllers supported by the stg driver include:

Adaptec 2920/A
Future Domain SCSI2GO
Future Domain TMC-18XX/3260
IBM SCSI PCMCIA Card

ICM PSC-2401 SCSI
MELCO IFC-SC
RATOC REX-5536, REX-5536AM, REX-5536M, REX-9836A
Note that the Adaptec 2920C is supported by the **ahc** driver.

Cards supported by the isp driver include:

ISP1000
PTI SBS440
ISP1020
ISP1040
PTI SBS450
Qlogic 1240
Qlogic 1020
Qlogic 1040
Qlogic 1080
Qlogic 1280
Qlogic 12160
Qlogic 2100
Qlogic 2102
Qlogic 2200
Qlogic 2202
Qlogic 2204
Qlogic 2300
Qlogic 2312
PTI SBS470
Antares P-0033

Controllers supported by the amd driver include:

MELCO IFC-DP (PC-98)
Tekram DC390
Tekram DC390T

Controllers supported by the nsp driver include:

Alpha-Data AD-PCS201
I-O DATA CBSC16
Adaptec AIC-7110 Parallel to SCSI interfaces (**vpo** driver)

The following controllers are supported by the ida driver:

Compaq SMART Array 221
Compaq Integrated SMART Array Controller
Compaq SMART Array 4200
Compaq SMART Array 4250ES
Compaq SMART 3200 Controller
Compaq SMART 3100ES Controller
Compaq SMART-2/DH Controller
Compaq SMART-2/SL Controller
Compaq SMART-2/P Controller
Compaq SMART-2/E Controller

Compaq SMART Controller

Controllers supported by the ciss driver include:

Compaq Smart Array 5300
Compaq Smart Array 532
Compaq Smart Array 5i
HP Smart Array 5312
HP Smart Array 6i
HP Smart Array 641
HP Smart Array 642
HP Smart Array 6400
HP Smart Array 6400 EM
HP Smart Array 6422
HP Smart Array V100
HP Modular Smart Array 20 (MSA20)
HP Modular Smart Array 500 (MSA500)

Controllers supported by the iir driver include:

Intel RAID Controller SRCMR
Intel Server RAID Controller U3-1 (SRCU31a)
Intel Server RAID Controller U3-1L (SRCU31La)
Intel Server RAID Controller U3-2 (SRCU32)
All past and future releases of Intel and ICP RAID Controllers.
Intel RAID Controller SRCU21 (discontinued)
Intel RAID Controller SRCU31 (older revision, not compatible)
Intel RAID Controller SRCU31L (older revision, not compatible)
The SRCU31 and SRCU31L can be updated via a firmware update available from Intel.
Promise SuperTrak ATA RAID controllers (pst driver)

The hptmv driver supports the HighPoint RocketRAID 182x SATA controllers.

Controllers supported by the ips driver include:

IBM ServeRAID 3H
ServeRAID 4L/4M/4H
ServeRAID Series 5
ServeRAID 6i/6M

The following controllers are supported by the mpt driver:

LSI Logic 53c1030 (Dual Ultra320 SCSI)
LSI Logic FC909 (1Gb/s Fibre Channel)
LSI Logic FC909A (Dual 1Gb/s Fibre Channel)
LSI Logic FC919 (2Gb/s Fibre Channel)
LSI Logic FC929 (Dual 2Gb/s Fibre Channel)
The SCSI controller chips supprted by the **mpt** driver can be found onboard on many systems including:
Dell PowerEdge 1750
IBM eServer xSeries 335

SCSI controllers supported by the trm driver include:

Tekram DC-315 PCI Ultra SCSI adapter without BIOS and internal SCSI connector
Tekram DC-315U PCI Ultra SCSI adapter without BIOS

Tekram DC-395F PCI Ultra-Wide SCSI adapter with flash BIOS and 68-pin external SCSI connector

Tekram DC-395U PCI Ultra SCSI adapter with flash BIOS

Tekram DC-395UW PCI Ultra-Wide SCSI adapter with flash BIOS

Tekram DC-395U2W PCI Ultra2-Wide SCSI adapter with flash BIOS

For the Tekram DC-310/U and DC-390F/U/UW/U2B/U2W/U3W PCI SCSI host adapters, use the **sym** driver.

The wds driver supports the WD7000 SCSI controller.

7.5.2   Network Cards

R-Studio Agent Emergency is based on the **FreeBSD 5.3** kernel and supports devices from the list published at http://www.freebsd.org/releases/5.3R/hardware-i386.html.

*: Supported in the floppy version

Ethernet NICs

Adapters supported by the sf driver include:

ANA-62011 64-bit single port 10/100baseTX adapter

ANA-62022 64-bit dual port 10/100baseTX adapter

ANA-62044 64-bit quad port 10/100baseTX adapter

ANA-69011 32-bit single port 10/100baseTX adapter

ANA-62020 64-bit single port 100baseFX adapter

The ti driver supports Gigabit Ethernet adapters based on the Alteon Tigon I and II chips. The ti driver has been tested with the following adapters:

3Com 3c985-SX Gigabit Ethernet adapter (Tigon 1)

3Com 3c985B-SX Gigabit Ethernet adapter (Tigon 2)

Alteon AceNIC V Gigabit Ethernet adapter (1000baseSX)

Alteon AceNIC V Gigabit Ethernet adapter (1000baseT)

Digital EtherWORKS 1000SX PCI Gigabit adapter

Netgear GA620 Gigabit Ethernet adapter (1000baseSX)

Netgear GA620T Gigabit Ethernet adapter (1000baseT)

The following adapters should also be supported but have not yet been tested:

Asante GigaNIX1000T Gigabit Ethernet adapter

Asante PCI 1000BASE-SX Gigabit Ethernet adapter

Farallon PN9000SX Gigabit Ethernet adapter

NEC Gigabit Ethernet

Silicon Graphics PCI Gigabit Ethernet adapter

The pcn driver supports adapters and embedded controllers based on the AMD PCnet/FAST, PCnet/FAST+, PCnet/FAST III, PCnet/PRO and PCnet/Home Fast Ethernet chips:

AMD Am53C974/Am79C970/Am79C974 PCnet-PCI *

AMD Am79C970A PCnet-PCI II *

AMD Am79C971 PCnet-FAST *

AMD Am79C972 PCnet-FAST+ *

AMD Am79C973/Am79C975 PCnet-FAST III *

AMD Am79C976 PCnet-PRO *

AMD PCnet/Home HomePNA

Allied-Telesis LA-PCI

Contec C-NET(98)S (PC-98)
NEC SV-98/2-B05, B06

The lnc driver supports the following adapters:

Novell NE2100 *
Novell NE32-VL *
Isolan AT 4141-0 (16 bit)
Isolan BICC
Isolink 4110 (8 bit)
Diamond HomeFree
Digital DEPCA
Hewlett Packard Vectra 486/66XM
Hewlett Packard Vectra XU

Also supported are adapters working with the **pcn** driver. The **lnc** driver runs these in compatibility mode, thus the **pcn** driver should be preferred.

SMC 83c17x (EPIC)-based Ethernet NICs (**tx** driver)

The ed driver supports the following Ethernet NICs:

3Com 3c503 Etherlink II
AR-P500 Ethernet
Accton EN1644 (old model), EN1646 (old model), EN2203 (old model) (110pin) (flags 0xd00000)
Accton EN2212/EN2216/UE2216
Allied Telesis CentreCOM LA100-PCM_V2
Allied Telesis LA-98 (flags 0x000000) (PC-98)
Allied Telesis SIC-98, SIC-98NOTE (110pin), SIU-98 (flags 0x600000) (PC-98)
Allied Telesis SIU-98-D (flags 0x610000) (PC-98)
AmbiCom 10BaseT card
Bay Networks NETGEAR FA410TXC Fast Ethernet
CNet BC40 adapter
Compex Net-A adapter
Contec C-NET(98), RT-1007(98), C-NET(9N) (110pin) (flags 0xa00000) (PC-98)
Contec C-NET(98)E-A, C-NET(98)L-A, C-NET(98)P (flags 0x300000) (PC-98)
Corega Ether98-T (flags 0x000000) (PC-98)
Corega Ether PCC-T/EtherII PCC-T/FEther PCC-TXF/PCC-TXD
CyQ've ELA-010
DEC EtherWorks DE305
Danpex EN-6200P2
D-Link DE-298, DE-298P (flags 0x500000) (PC-98)
D-Link DE-650/660
D-Link IC-CARD/IC-CARD+ Ethernet
ELECOM LD-98P (flags 0x500000) (PC-98)
ELECOM LD-BDN, LD-NW801G (flags 0x200000) (PC-98)
ELECOM Laneed LD-CDL/TX, LD-CDF, LD-CDS, LD-10/100CD, LD-CDWA (DP83902A)
HP PC Lan+ 27247B and 27252A
IBM Creditcard Ethernet I/II
ICM AD-ET2-T, DT-ET-25, DT-ET-T5, IF-2766ET, IF-2771ET, NB-ET-T (110pin) (flags 0x500000)

(PC-98)
I-O DATA LA/T-98, LA/T-98SB, LA2/T-98, ET/T-98 (flags 0x900000) (PC-98)
I-O DATA ET2/T-PCI
I-O DATA PCLATE
Kansai KLA-98C/T (flags 0x900000) (PC-98)
Kingston KNE-PC2, KNE-PCM/x Ethernet
Linksys EC2T/PCMPC100/PCM100, PCMLM56
Linksys EtherFast 10/100 PC Card, Combo PCMCIA Ethernet Card (PCMPC100 V2)
Logitec LAN-98T (flags 0xb00000) (PC-98)
MACNICA Ethernet ME1 for JEIDA
MACNICA ME98 (flags 0x900000) (PC-98)
MACNICA NE2098 (flags 0x400000) (PC-98)
MELCO EGY-98 (flags 0x300000) (PC-98)
MELCO LGH-98, LGY-98, LGY-98-N (110pin), IND-SP, IND-SS (flags 0x400000) (PC-98)
MELCO LGY-PCI-TR
MELCO LPC-T/LPC2-T/LPC2-CLT/LPC2-TX/LPC3-TX/LPC3-CLX
NDC Ethernet Instant-Link
NEC PC-9801-77, PC-9801-78 (flags 0x910000) (PC-98)
NEC PC-9801-107, PC-9801-108 (flags 0x800000) (PC-98)
National Semiconductor InfoMover NE4100
NetGear FA-410TX
NetVin 5000
Network Everywhere Ethernet 10BaseT PC Card
Networld 98X3 (flags 0xd00000) (PC-98)
Networld EC-98X, EP-98X (flags 0xd10000) (PC-98)
Novell NE1000/NE2000/NE2100
PLANEX ENW-8300-T
PLANEX EN-2298-C (flags 0x200000) (PC-98)
PLANEX EN-2298P-T, EN-2298-T (flags 0x500000) (PC-98)
PLANEX FNW-3600-T
RealTek 8029
SMC Elite 16 WD8013
SMC Elite Ultra
SMC EtherEZ98 (flags 0x000000) (PC-98)
SMC   WD8003E/WD8003EBT/WD8003S/WD8003SBT/WD8003W/WD8013EBT/WD8013W   and
clones
Socket LP-E
Surecom EtherPerfect EP-427
Surecom NE-34
TDK LAK-CD031, Grey Cell GCS2000 Ethernet Card
Telecom Device SuperSocket RE450T
VIA VT86C926
Winbond W89C940
C-Bus, ISA, PCI and PC Card devices are supported.

Adapters supported by the rl driver include:
 Accton ``Cheetah'' EN1207D (MPX 5030/5038; RealTek 8139 clone)
 Allied Telesyn AT2550
 Allied Telesyn AT2500TX
 Belkin F5D5000
 BUFFALO(Melco INC.) LPC-CB-CLX(CardBus)
 Compaq HNE-300
 CompUSA no-name 10/100 PCI Ethernet NIC
 Corega FEther CB-TXD
 Corega FEtherII CB-TXD
 D-Link DFE-530TX+
 D-Link DFE-538TX (same as 530+?)
 D-Link DFE-690TXD
 Edimax EP-4103DL CardBus
 Encore ENL832-TX 10/100 M PCI
 Farallon NetLINE 10/100 PCI
 Genius GF100TXR,
 GigaFast Ethernet EE100-AXP
 KTX-9130TX 10/100 Fast Ethernet
 LevelOne FPC-0106TX
 Longshine LCS-8038TX-R
 NDC Communications NE100TX-E
 Netronix Inc. EA-1210 NetEther 10/100
 Nortel Networks 10/100BaseTX
 OvisLink LEF-8129TX
 OvisLink LEF-8139TX
 Peppercon AG ROL-F
 Planex FNW-3800-TX
 SMC EZ Card 10/100 PCI 1211-TX
 SOHO(PRAGMATIC) UE-1211C

The wb driver supports Winbond W89C840F based Fast Ethernet adapters and embedded controllers including:
 Trendware TE100-PCIE *

The vr driver supports VIA Technologies Rhine I, Rhine II, and Rhine III based Fast Ethernet adapters including:
 D-Link DFE530-TX
 Hawking Technologies PN102TX
 AOpen/Acer ALN-320

The sis driver supports Silicon Integrated Systems SiS 900 * and SiS 7016 * based Fast Ethernet adapters and embedded controllers, as well as Fast Ethernet adapters based on the National Semiconductor DP83815 (MacPhyter) chip. Supported adapters include:
 @Nifty FNECHARD IFC USUP-TX
 MELCO LGY-PCI-TXC
 Netgear FA311-TX (DP83815)
 Netgear FA312-TX (DP83815)

SiS 630, 635, and 735 motherboard chipsets

The nge driver supports National Semiconductor DP83820 * and DP83821 based Gigabit Ethernet adapters including:

SMC EZ Card 1000 (SMC9462TX)

D-Link DGE-500T

Asante FriendlyNet GigaNIX 1000TA and 1000TPC

Addtron AEG320T

LinkSys EG1032 (32-bit PCI) and EG1064 (64-bit PCI)

Surecom Technology EP-320G-TX

Netgear GA622T

Netgear GA621

Ark PC SOHO-GA2500T (32-bit PCI) and SOHO-GA2000T (64-bit PCI)

Trendware TEG-PCITX (32-bit PCI) and TEG-PCITX2 (64-bit PCI)

The ste driver supports Sundance Technologies ST201 based Fast Ethernet adapters and embedded controllers including:

D-Link DFE-530TXS

D-Link DFE-550TX

Adapters supported by the sk driver include:

3COM 3C940 single port, 1000baseT adapter

Belkin F5D5005 single port, 1000baseT adapter

Linksys EG1032 single port, 1000baseT adapter

SK-9521 SK-NET GE-T single port, 1000baseT adapter

SK-9821 SK-NET GE-T single port, 1000baseT adapter *

SK-9822 SK-NET GE-T dual port, 1000baseT adapter *

SK-9841 SK-NET GE-LX single port, single mode fiber adapter *

SK-9842 SK-NET GE-LX dual port, single mode fiber adapter *

SK-9843 SK-NET GE-SX single port, multimode fiber adapter *

SK-9844 SK-NET GE-SX dual port, multimode fiber adapter *

SMC 9452TX single port, 1000baseT adapter

The tl driver supports Texas Instruments ThunderLAN based Ethernet and Fast Ethernet adapters including a large number of Compaq PCI Ethernet adapters. Also supported are:

Olicom OC-2135/2138 10/100 TX UTP adapter

Olicom OC-2325/OC-2326 10/100 TX UTP adapter

Racore 8148 10baseT/100baseTX/100baseFX adapter

Racore 8165 10/100baseTX adapter

The tl driver also supports the built-in Ethernet adapters of various Compaq Prosignia servers and Compaq Deskpro desktop machines including:

Compaq Netelligent 10

Compaq Netelligent 10 T PCI UTP/Coax

Compaq Netelligent 10/100

Compaq Netelligent 10/100 Dual-Port

Compaq Netelligent 10/100 Proliant

Compaq Netelligent 10/100 TX Embedded UTP

Compaq Netelligent 10/100 TX UTP

Compaq NetFlex 3P

Compaq NetFlex 3P Integrated

Compaq NetFlex 3P w/BNC

The dc driver provides support for the following chipsets: *

DEC/Intel 21143

ADMtek AL981 Comet, AN985 Centaur, ADM9511 Centaur II and ADM9513 Centaur II

ASIX Electronics AX88140A and AX88141

Conexant LANfinity RS7112 (miniPCI)

Davicom DM9009, DM9100, DM9102 and DM9102A

Lite-On 82c168 and 82c169 PNIC

Lite-On/Macronix 82c115 PNIC II

Macronix 98713, 98713A, 98715, 98715A, 98715AEC-C, 98725, 98727 and 98732

Xircom X3201 (cardbus only)

The following NICs are known to work with the dc driver at this time:

3Com OfficeConnect 10/100B (ADMtek AN985 Centaur-P)

Abocom FE2500

Accton EN1217 (98715A)

Accton EN2242 MiniPCI

Adico AE310TX (98715A)

Alfa Inc GFC2204 (ASIX AX88140A)

Built in 10Mbps only Ethernet on Compaq Presario 7900 series desktops (21143, non-MII)

Built in DE500-BA on DEC Alpha workstations (21143, non-MII)

Built in Sun DMFE 10/100 Mbps Ethernet on Sun Netra X1 and Sun Fire V100 (DM9102A, MII)

Built in Ethernet on LinkSys EtherFast 10/100 Instant GigaDrive (DM9102, MII)

CNet Pro110B (ASIX AX88140A)

CNet Pro120A (98715A or 98713A) and CNet Pro120B (98715)

Compex RL100-TX (98713 or 98713A)

D-Link DFE-570TX (21143, MII, quad port)

Digital DE500-BA 10/100 (21143, non-MII)

ELECOM Laneed LD-CBL/TXA (ADMtek AN985)

Hawking CB102 CardBus

IBM EtherJet Cardbus Adapter

Intel PRO/100 Mobile Cardbus (versions that use the X3201 chipset)

Jaton XpressNet (Davicom DM9102)

Kingston KNE100TX (21143, MII)

Kingston KNE110TX (PNIC 82c169)

LinkSys LNE100TX (PNIC 82c168, 82c169)

LinkSys LNE100TX v2.0 (PNIC II 82c115)

LinkSys LNE100TX v4.0/4.1 (ADMtek AN985 Centaur-P)

Matrox FastNIC 10/100 (PNIC 82c168, 82c169)

Melco LGY-PCI-TXL

Microsoft MN-120 10/100 CardBus (ADMTek Centaur-C)

Microsoft MN-130 10/100 PCI (ADMTek Centaur-P)

NDC SOHOware SFA110A (98713A)

NDC SOHOware SFA110A Rev B4 (98715AEC-C)

NetGear FA310-TX Rev. D1, D2 or D3 (PNIC 82c169)
Netgear FA511
PlaneX FNW-3602-T (ADMtek AN985)
SMC EZ Card 10/100 1233A-TX (ADMtek AN985)
SVEC PN102-TX (98713)
Xircom Cardbus Realport
Xircom Cardbus Ethernet 10/100
Xircom Cardbus Ethernet II 10/100

Adapters supported by the aue driver include:
Abocom UFE1000, DSB650TX_NA
Accton USB320-EC, SpeedStream
ADMtek AN986, AN8511
Billionton USB100, USB100LP, USB100EL, USBE100
Corega Ether FEther USB-T, FEther USB-TX, FEther USB-TXS
D-Link DSB-650, DSB-650TX, DSB-650TX-PNA
Elecom LD-USBL/TX
Elsa Microlink USB2Ethernet
HP hn210e
I-O Data USB ETTX
Kingston KNU101TX
LinkSys USB10T adapters that contain the AN986 Pegasus chipset, USB10TA, USB10TX, USB100TX, USB100H1
MELCO LUA-TX, LUA2-TX
Planex UE-200TX
Sandberg USB to Network Link (model number 133-06)
Siemens Speedstream
SmartBridges smartNIC
SMC 2202USB
SOHOware NUB100

The cue driver supports CATC USB-EL1210A based USB Ethernet adapters including:
Belkin F5U011/F5U111
CATC Netmate
CATC Netmate II
SmartBridges SmartLink

The kue driver supports Kawasaki LSI KL5KLUSB101B based USB Ethernet adapters including:
3Com 3c19250
3Com 3c460 HomeConnect Ethernet USB Adapter
ADS Technologies USB-10BT
AOX USB101
ATen UC10T
Abocom URE 450
Corega USB-T
D-Link DSB-650C
Entrega NET-USB-E45, NET-HUB-3U1E

I/O Data USB ETT
Kawasaki DU-H3E
LinkSys USB10T
Netgear EA101
Peracom USB Ethernet Adapter
SMC 2102USB, 2104USB

The axe driver supports ASIX Electronics AX88172 based USB Ethernet adapters including:

Buffalo (Melco Inc.) LUA-U2-KTX
D-Link DUBE100
LinkSys USB200M
Netgear FA120
System TALKS Inc. SGC-X2UL

The rue driver supports RealTek RTL8150 based USB Ethernet adapters including:

Buffalo (Melco Inc.) LUA-KTX
Green House GH-USB100B
LinkSys USB100M
Billionton 10/100 FastEthernet USBKR2

The udav driver supports the following adapters:

Corega FEther USB-TXC

Adapters supported by the de driver include:

Adaptec ANA-6944/TX
Cogent EM100FX and EM440TX
Corega FastEther PCI-TX
D-Link DFE-500TX
DEC DE435, DE425, DEC DE450, and DEC DE500
ELECOM LD-PCI2T, LD-PCITS
I-O DATA LA2/T-PCI
SMC Etherpower 8432, 9332 and 9334
ZNYX ZX3xx

Controllers and cards supported by the fe driver include:

Allied Telesis RE1000, RE1000Plus, ME1500 (110-pin)
CONTEC C-NET(98)P2, C-NET (9N)E (110-pin), C-NET(9N)C (ExtCard)
CONTEC C-NET(PC)C PCMCIA Ethernet
Eiger Labs EPX-10BT
Fujitsu FMV-J182, FMV-J182A
Fujitsu MB86960A, MB86965A
Fujitsu MBH10303, MBH10302 Ethernet PCMCIA
Fujitsu Towa LA501 Ethernet
HITACHI HT-4840-11
NextCom J Link NC5310
RATOC REX-5588, REX-9822, REX-4886, and REX-R280
RATOC REX-9880/9881/9882/9883
TDK LAC-98012, LAC-98013, LAC-98025, LAC-9N011 (110-pin)
TDK LAK-CD021, LAK-CD021A, LAK-CD021BX

Ungermann-Bass Access/PC N98C+(PC85152, PC85142), Access/NOTE N98(PC86132) (110-pin)

Adapters supported by the [fxp](#) driver include:

Intel EtherExpress PRO/10

Intel InBusiness 10/100

Intel PRO/100B / EtherExpressPRO/100 B PCI Adapter *

Intel PRO/100+ Management Adapter

Intel PRO/100 VE Desktop Adapter

Intel PRO/100 M Desktop Adapter

Intel PRO/100 S Desktop, Server and Dual-Port Server Adapters

Contec C-NET(PI)-100TX (PC-98)

NEC PC-9821Ra20, Rv20, Xv13, Xv20 internal 100Base-TX (PC-98)

NEC PC-9821X-B06 (PC-98)

Many on-board network interfaces on Intel motherboards

The [ex](#) driver supports the following Ethernet adapters:

Intel EtherExpress Pro/10

Intel EtherExpress Pro/10+

The Olicom OC2220

The [ie](#) driver provides supports the following 8 and 16bit ISA Ethernet cards that are based on the Intel i82586 chip:

3COM 3C507

AT&T EN100

AT&T Starlan 10

AT&T Starlan Fiber

Intel EtherExpress 16

RACAL Interlan NI5210

The [ep](#) driver supports Ethernet adapters based on the 3Com 3C5x9 Etherlink III Parallel Tasking chipset, including:

3Com 3C1 CF

3Com 3C509-TP, 3C509-BNC, 3C509-Combo, 3C509-TPO, 3C509-TPC ISA

3Com 3C509B-TP, 3C509B-BNC, 3C509B-Combo, 3C509B-TPO, 3C509B-TPC ISA

3Com 3C529, 3C529-TP MCA

3Com 3C562/3C563 PCMCIA

3Com 3C569B-J-TPO, 3C569B-J-COMBO CBUS

3Com 3C574-TX, 3CCFE574BT, 3CXFE574BT, 3C3FE574BT PCMCIA

3Com 3C579-TP, 3C579-BNC EISA

3Com 3C589, 3C589B, 3C589C, 3C589D, 3CXE589DT PCMCIA

3Com 3CCFEM556B, 3CCFEM556BI PCMCIA

3Com 3CXE589EC, 3CCE589EC, 3CXE589ET, 3CCE589ET PCMCIA

3Com Megahertz 3CCEM556, 3CXEM556, 3CCEM556B, 3CXEM556B PCMCIA

3Com OfficeConnect 3CXSH572BT, 3CCSH572BT PCMCIA

Farallon EtherMac PCMCIA

The [el](#) driver supports the 3Com 3c501 8bit ISA Ethernet card.

The [xl](#) driver supports the following hardware:

3Com 3c900-TPO *

3Com 3c900-COMBO *

3Com 3c905-TX *

3Com 3c905-T4 *

3Com 3c900B-TPO *

3Com 3c900B-TPC *

3Com 3c900B-FL *

3Com 3c900B-COMBO *

3Com 3c905B-T4 *

3Com 3c905B-TX *

3Com 3c905B-FX *

3Com 3c905B-COMBO *

3Com 3c905C-TX *

3Com 3c980, 3c980B, and 3c980C server adapters

3Com 3cSOHO100-TX OfficeConnect adapters

3Com 3c450 HomeConnect adapters

3Com 3c555, 3c556 and 3c556B mini-PCI adapters

3Com 3C3SH573BT, 3C575TX, 3CCFE575BT, 3CXFE575BT, 3CCFE575CT, 3CXFE575CT, 3CCFEM656, 3CCFEM656B, and 3CCFEM656C, 3CXFEM656, 3CXFEM656B, and 3CXFEM656C CardBus adapters

3Com 3c905-TX, 3c905B-TX 3c905C-TX, and 3c920B-EMB embedded adapters

Both the 3C656 family of CardBus cards and the 3C556 family of MiniPCI cards have a built-in proprietary modem. Neither the xl driver nor any other driver supports this modem.

The vx driver supports the following cards:

3Com 3c590 EtherLink III PCI *

3Com 3c592 EtherLink III EISA

3Com 3c595 Fast EtherLink III PCI in 10 Mbps mode *

3Com 3c597 Fast EtherLink III EISA in 10 Mbps mode

Crystal Semiconductor CS89x0-based NICs (**cs** driver)

The sn driver supports SMC9xxx based ISA and PCMCIA cards including:

3Com Megahertz X-Jack Ethernet PC-Card CC-10BT

The xe driver supports the following cards:

Xircom CreditCard Ethernet (PS-CE2-10)

Xircom CreditCard Ethernet + Modem 28 (PS-CEM-28)

Xircom CreditCard Ethernet + Modem 33 (CEM33)

Xircom CreditCard 10/100 (CE3, CE3B)

Xircom CreditCard Ethernet 10/100 + Modem 56 (CEM56)

Xircom RealPort Ethernet 10 (RE10)

Xircom RealPort Ethernet 10/100 (RE100)

Xircom RealPort Ethernet 10/100 + Modem 56 (REM56, REM56G)

Accton Fast EtherCard-16 (EN2226)

Compaq Netelligent 10/100 PC Card (CPQ-10/100)

Intel EtherExpress Pro/100 PC Card Mobile Adapter 16 (Pro/100 M16A)

Other similar devices using the same hardware may also be supported.

Adapters supported by the lge driver include:

SMC TigerCard 1000 (SMC9462SX) *
D-Link DGE-500SX *

The txp driver supports the following cards:

3Com 3CR990-TX-95 *
3Com 3CR990-TX-97 *
3Com 3cR990B-TXM *
3Com 3CR990SVR95 *
3Com 3CR990SVR97 *
3Com 3cR990B-SRV *

The bge driver provides support for various NICs based on the Broadcom BCM570x family of Gigabit Ethernet controller chips, including the following:

3Com 3c996-T (10/100/1000baseTX) *
Dell PowerEdge 1750 integrated BCM5704C NIC (10/100/1000baseTX) *
Dell PowerEdge 2550 integrated BCM5700 NIC (10/100/1000baseTX) *
Dell PowerEdge 2650 integrated BCM5703 NIC (10/100/1000baseTX) *
IBM x235 server integrated BCM5703x NIC (10/100/1000baseTX) *
HP ProLiant NC7760 embedded Gigabit NIC (10/100/1000baseTX) *
HP ProLiant NC7770 PCI-X Gigabit NIC (10/100/1000baseTX) *
HP ProLiant NC7781 embedded PCI-X Gigabit NIC (10/100/1000baseTX) *
Netgear GA302T (10/100/1000baseTX) *
SysKonnect SK-9D21 (10/100/1000baseTX) *
SysKonnect SK-9D41 (1000baseSX) *

The em driver supports Gigabit Ethernet adapters based on the Intel 82540, 82541PI, 82542, 82543, 82544, 82546, 82546EB and 82547 controller chips:

Intel PRO/1000 CT Network Connection (82547)
Intel PRO/1000 F Server Adapter (82543)
Intel PRO/1000 Gigabit Server Adapter (82542)*
Intel PRO/1000 GT Desktop Adapter (82541PI)
Intel PRO/1000 MF Dual Port Server Adapter (82546)
Intel PRO/1000 MF Server Adapter (82545)
Intel PRO/1000 MF Server Adapter (LX) (82545)
Intel PRO/1000 MT Desktop Adapter (82540)
Intel PRO/1000 MT Desktop Adapter (82541)
Intel PRO/1000 MT Dual Port Server Adapter (82546)
Intel PRO/1000 MT Quad Port Server Adapter (82546EB)
Intel PRO/1000 MT Server Adapter (82545)
Intel PRO/1000 T Desktop Adapter (82544)
Intel PRO/1000 T Server Adapter (82543)
Intel PRO/1000 XF Server Adapter (82544)
Intel PRO/1000 XT Server Adapter (82544)

The gx driver supports Gigabit Ethernet adapters based on the Intel 82542 and 82543 controller chips:

Intel PRO/1000 Gigabit Server Adapter (82542)
Intel PRO/1000 F Server Adapter (82543)

Intel PRO/1000 T Server Adapter (82543)

The [hme](#) driver supports the on-board Ethernet interfaces of many Sun UltraSPARC workstation and server models. Cards supported by the [hme](#) driver include:

Sun PCI SunSwift Adapter

Sun SBus SunSwift Adapter ``( hme'' and ``SUNW,hme'')

Sun PCI Sun100BaseT Adapter 2.0

Sun SBus Sun100BaseT 2.0

Sun PCI Quad FastEthernet Controller

Sun SBus Quad FastEthernet Controller

The [my](#) driver provides support for various NICs based on the Myson chipset. Supported models include:

Myson MTD800 PCI Fast Ethernet chip

Myson MTD803 PCI Fast Ethernet chip

Myson MTD89X PCI Gigabit Ethernet chip

Broadcom BCM4401 based Fast Ethernet adapters ([bfe](#) driver) *

The [re](#) driver supports RealTek RTL8139C+, RTL8169, RTL8169S and RTL8110S based Fast Ethernet and Gigabit Ethernet adapters including:

Alloy Computer Products EtherGOLD 1439E 10/100 (8139C+) *

Compaq Evo N1015v Integrated Ethernet (8139C+) *

Corega CG-LAPCIGT Gigabit Ethernet (8169S) *

Gigabyte 7N400 Pro2 Integrated Gigabit Ethernet (8110S) *

PLANEX COMMUNICATIONS Inc. GN-1200TC (8169S) *

Xterasys XN-152 10/100/1000 NIC (8169) *

The [ixgb](#) driver supports the following cards:

Intel PRO/10GbE LR Server Adapter *

Intel PRO/10GbE SR Server Adapter *

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